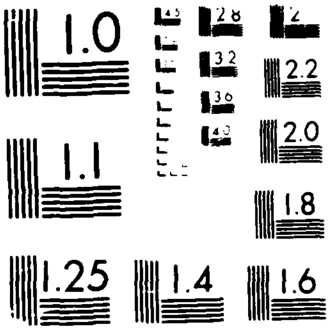
AD-A191 120 UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH PROGRAM (1987) PROGRAM MA (U) UNIVERSAL ENERGY SYSTEMS INC DAYTON OH R C DARRAH ET AL DEC 87 AFOSR-TR-88-0211 1/4

UNCLASSIFIED F49620-85-C-0015 F/G 5/1 NL



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UNITED STATES AIR FORCE

SUMMER FACULTY RESEARCH PROGRAM

1987

PROGRAM MANAGEMENT REPORT

UNIVERSAL ENERGY SYSTEMS, INC.

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Submitted to

Air Force Office of Scientific Research

Bolling Air Force Base

Washington, DC

December 1987

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AFOSR-TR- 88-0211

SECURITY CLASSIFICATION OF THIS PAGE

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution unlimited.
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S)	5. MONITORING ORGANIZATION REPORT NUMBER(S) AFOSR-TR- 88-0 [illegible]
6a. NAME OF PERFORMING ORGANIZATION Universal Energy Systems Inc. 6b. OFFICE SYMBOL (If applicable)	7a. NAME OF MONITORING ORGANIZATION AFOSR/XOT
6c. ADDRESS (City, State, and ZIP Code) 4401 Dayton-Xenia Road Dayton, OH 45432	7b. ADDRESS (City, State, and ZIP Code) Building 410 Bolling AFB DC 20332-6448
8a. NAME OF FUNDING/SPONSORING ORGANIZATION Same as #7 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER F49620-85-C-0013
8c. ADDRESS (City, State, and ZIP Code) Same as #7	10. SOURCE OF FUNDING NUMBERS

PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
61102F	3396	D5	

11. TITLE (Include Security Classification)
USAF Summer Faculty Research Program - Management Report - 1987

12. PERSONAL AUTHOR(S)
Rodney C. Darrah, Susan K. Espy

13a. TYPE OF REPORT	13b. TIME COVERED	14. DATE OF REPORT (Year, Month, Day)	15. PAGE COUNT
Annual	FROM ______ TO ______	December 1987	

16. SUPPLEMENTARY NOTATION

17. COSATI CODES

FIELD	GROUP	SUB-GROUP

18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

See Attached

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☐ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED
22a. NAME OF RESPONSIBLE INDIVIDUAL LT. COL. CLAUDE CAVENDER	22b. TELEPHONE (Include Area Code) 202-767-4970 22c. OFFICE SYMBOL XOT

DD Form 1473, JUN 86 Previous editions are obsolete. SECURITY CLASSIFICATION OF THIS PAGE

I. INTRODUCTION

Universal Energy Systems, Inc. (UES) was awarded the United States Air Force Summer Faculty Research Program on August 15, 1984. The contract is funded under the Air Force Systems Command by the Air Force Office of Scientific Research.

The program has been in existance since 1978 and has been conducted by several different contractors. The success of the program is evident from its history of expansion since 1978.

The Summer Faculty Research Program (SFRP) provides opportunities for research in the physical sciences, engineering, life sciences, business, and administrative sciences. The program has been effective in providing basic research opportunities to the faculty of universities, colleges, and technical institutions throughout the United States.

The program is available to faculty members in all academic grades: instructor, assistant professor, professor, department chairman, and research facility directors. It has proven especially beneficial to young faculty members who are starting their academic research programs and to senior faculty members who have spent time in university administration and are desirous of returning to scholarly research programs.

Beginning with the 1982 program, research opportunities were provided for 17 graduate students. The 1982 pilot student program was highly successful and was expanded in 1983 to 53 students; there were 84 graduate students in the 1984 program.

In the previous programs, the graduate students were selected along with their professors to work on the program. Starting with the 1985 program, the graduate students were selected on their own merits. They were assigned to be supervised by either a professor on the program or by an engineer at the Air Force Laboratories participating in the program. There were 92 graduate students selected for the 1985 program.

Again in the 1986 program, the graduate students were selected on their own merits, and assigned to be supervised by either a professor on the program or by an engineer at the participating Air Force Laboratory. There were 100 graduate students selected for the 1986 program.

Follow-on research opportunities have been developed for a large percentage of the participants in the Summer Faculty Research Program in 1979-1983 period through an AFOSR Minigrant Program.

On 1 September 1983, AFOSR replaced the Minigrant Program with a new Research Initiation Program. The Research Initiation Program provides follow-on research awards to home institutions of SFRP participants. Awards were made to approximately 50 researchers in 1983. The awards were for a maximum of $12,000 and a duration of one year or less. Substantial cost sharing by the schools contributes significantly to the value of the Research Initiation Program. In 1984 there were approximately 80 Research Initiation awards.

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For the 1985 program, the amount of the Research Initiation Program was increased to a maximum of $20,000. Cost sharing by the Universities for the program was encouraged. There were 82 Research Initiation awards following the 1985 Summer Program. There were 97 Research Initiaton awards following the 1986 Summer Program. There will be approximately 75 Research Initiation Program awards following the 1987 Summer Program.

II. RECRUITING AND SELECTION

The program is conducted on a nationally advertised and competitive selection basis. Advertising for the 1987 program was conducted via direct mail to all accredited schools. The mailing was sent to the department chairman at the schools. The departments included biology, genetics, ecology, entomology, chemistry, computer science, graphics, mathematics, physics, aeronautical engineering, ceramic engineering, chemical engineering, materials science, mechanical engineering, electrical engineering, metalurgy, nuclear science, and psychology. The brochures were also mailed to all of the participants in the 1985 and 1986 program. Brochures were mailed to the Presidents of Historically Black Colleges. The brochures were sent to all participating USAF laboratories/centers; distribution was made through AFROTC units on university campuses; information was supplied to all who made requests. Overall, more than 12,000 brochures were distributed throughout the country.

In 1979, 70 faculty members participated. In 1980 and 1981, 87 faculty members participated each year; 91 faculty and 17 students participated in the 1982 program. In 1983, 101 faculty and 53 students participated. In the 1984 program there were 152 faculty members and 84 graduate students appointed to the Air Force facilities. For the 1985 program, 154 faculty members and 92 graduate students were assigned to the Air Force laboratory/centers. In 1986, 158 faculty and 100 graduate students participated. For the 1987 program, 159 faculty and 101 graduate students were assigned to the Air Force Laboratories/Centers.

Application deadline was February 1, 1987. There were over four (4) applications received for each position available on the 1987 Summer Faculty Research Program. The selection panels met in February. The announcements of selections were mailed on March 1, 1987. In total 195 offers of position were made for the Summer Faculty Research Program, with 159 professors accepting appointments.

III. PRE-SUMMER VISIT (Optional)

Each Summer Fellow was directed to contact the designated representative at the laboratory/center of assignment to discuss a pre-summer visit. The purpose of the pre-summer visit is basically threefold: 1) to meet with laboratory personnel, especially the Effort Focal Point with whom the Summer Fellow would be working most closely, and to become personally acquainted with the laboratory facilities; 2) to finalize and formalize objectives for the Summer Fellow's summer research period and report these to UES; 3) to make arrangements for lodging for the research period. The focus of this visit was on making sufficient preparations so that the ten week summer research effort would be effective.

IV. GRADUATE STUDENT SUMMER SUPPORT PROGRAM (GSSSP)

A pilot program for Graduate Student Summer Research via the AFOSR Summer Faculty Research Program (SFRP) was initiated in 1982. The program was developed as an adjunct effort to the SFRP. Its purpose is to provide funds for selected graduate students to work at appropriate Air Force laboratories or centers with supervising professors who hold concurrent SFRP appointments. During the 1984 program, 84 graduate students representing 42 schools and 20 disciplines were appointed from 112 applicants.

Starting with the 1985 GSSSP, emphasis was placed on selecting graduate students to be placed with either supervising professors on the SFRP or with the Air Force laboratory/center engineers. A total of 92 graduate students were selected to participate in the 1985 program.

In 1986, there were 163 GSSSP applicants. A total of 100 graduate students were appointed, representing 30 disciplines, 57 schools, and 32 states. In 1987, there were 178 GSSSP applicants. A total of 118 offers of appointments were made with 101 students accepting appointments representing 29 disciplines, 58 schools, and 29 states and Puerto Rico.

The 1987 GSSSP report is published as three separate documents under the 1987 Summer Faculty Research Program and are entitled, Graduate Student Summer Support Program Management Report and Technical Reports, Volume I and II, October 1987.

V. SITE VISITS

Visits listed below include those by UES and AFOSR personnel. The faculty, USAF research colleagues, and student participants are generally satisfied with the program. Criticisms were: a) too much paper work to administor program, b) housing difficult to find, c) delays experienced in receiving payment d) 10 weeks too short for research period.

June 9, 1987	Rome Air Development Center Griffiss Air Force Base, New York
June 11, 1987	Electronics Systems Division Geophysics Laboratory Hanscom Air Force Base, Massachusetts
June 17, 1987	Wright-Patterson Air Force Base Dayton, Ohio
June 22, 1987	Logistics Management Center Gunter AFS, Alabama
June 24, 1987	Engineering and Services Center Tyndall Air Force Base, Florida
June 25, 1987	Armament Laboratory Eglin Air Force Base, Florida

June 29, 1987	Defense Equal Opportunity Management Institute Patrick Air Force Base, Florida
June 30, 1987	Eastern Space and Missile Center Patrick Air Force Base, Florida
July 2, 1987	Arnold Engineering Development Center Arnold Air Force Station, Tennessee
July 9, 1987	School of Aerospace Medicine HRL: Training Systems Division HRL: Manpower and Personnel Division Occupational and Environment Health Laboratory Brooks Air Force Base, Texas
July 14, 1987	Rocket Propulsion Laboratory Edwards Air Force Base, California
July 15, 1987	Wright-Patterson Air Force Base Dayton, Ohio
July 23, 1987	HRL: Operations Training Division Williams Air Force Base, Arizona
July 24, 1987	Weapons Laboratory Kirtland Air Force Base, New Mexico
July 27, 1987	Frank J. Seiler Research Laboratory United States Air Force Academy, Colorado

Because of the proximity of UES to Wright-Patterson Air Force Base, several site visits were made to the following laboratories:

Aerospace Medical Research Laboratory
Aero Propulsion Laboratory
Avionics Laboratory
Business Research Management Center
Flight Dynamics Laboratory
Human Resources Laboratory
Logistics Command
Materials Laboratory
Wright-Patterson Air Force Base, Ohio

We find that the objectives of the SFRP are being well served. SFRP Research Fellows indicate that they are performing independent research, and are not being used as "summer help". There are some misconceptions by research colleagues and summer fellows concerning the purpose of the program; one misconception is that the program is suitable for repeated research efforts by an individual. However, in this program we have found no abuse of the non-personal services requirements. As expected, enthusiasm is high for the possibilities of follow-on funding by AFOSR at the home university. Research fellows often conduct lectures and seminars at the Air Force locations.

As a record of the documentation supplied to the appointees, the UES Information and Appointment Packets are provided in Appendix I of this report.

VI. HISTORICALLY BLACK COLLEGES/UNIVERSITIES (HBCU's) WORKSHOP

In support of the Summer Faculty Research Program, and as part of the UES EEO/Affirmative Action Program, UES sponsored an information booth at the NAFEO (National Association for Equal Opportunity in Higher Education) Conference. The conference was held on April 9 through April 12, 1987. UES provided information on the UES-AFOSR summer programs at this conference.

UES visited various Historical Black Colleges and Universities throughout the country. During these visits faculty and administrators were briefed on the benefits and research opportunities of the SFRP. The targeted groups within the University community were faculty of the Engineering, Physics, Mathematics, Life Sciences, Physical Sciences, and Computer Sciences Departments.

The objectives of the visits are to encourage administration support and faculty participation. The program's reception at each institution was very good.

Below is a summary of universities that were visited and the date:

OCTOBER 1986

Atlanta University, Atlanta, GA	October 1
Spelman College, Atlanta, GA	October 1
Morris Brown College, Atlanta GA	October 2
Clark University, Atlanta, GA	October 2
Morehouse College, Atlanta, GA	October 3
Florida A&M, Tallahassee, FL	October 6
Tennessee State, Nashville, TN	October 16
Fisk University, Nashville, TN	October 16
Meharry Med. College, Nashville, TN	October 17
Norfolk University, Norfolk, VA	October 23
Hampton University, Hampton, VA	October 24

NOVEMBER 1986

LeMoyne-Owen College, Memphis, TN	November 3
Grambling University, Grambling, LA	November 4
Southern University, Baton Rouge, LA	November 5
Xavier University, New Orleans, LA	November 6
Dillard University, New Orleans, LA	November 6
Southern University, New Orleans, LA	November 7
Kentucky State, Frankfort, KY	November 10
Alabama A&M Univ., Huntsville, AL	November 24
Tuskegee Institute, Tuskegee, AL	November 25
Alabama State Univ., Montgomery, AL	November 26

DECEMBER 1986

N.C. A&T Univ., Greensboro, NC	December 9/10

JANUARY 1987

Jackson State Univ., Jackson MS	January 15
Tougaloo Univ., Tougaloo, MS	January 16
Texas Southern Univ., Houston, TX	January 17/18
Prairie View A&M, Prairie View, TX	January 19/20
University of Puerto Rico, San Juan	January 21/22
University of Puerto Rico, Mayaguez	January 23/24

VII. AMD SCHOLAR PROGRAM

As part of the Special Studies section of the Summer Faculty Research Program, UES initiated a Scholar Program for the Aerospace Medical Division in 1986.

The USAF AMD Scholar Program was sponsored by the Air Force Aerospace Medical Division through the Air Force Office of Scientific Research (AFOSR) and conducted by Universal Energy Systems, Inc. (UES). It provides research opportunities for qualified Engineers and Scientists who have received their Ph.D. degrees, or equivalents, from technical programs at U.S. Universities or Technical Institutions. These opportunities consist of one year research appointments with the Aerospace Medical Division with laboratories located at

Brooks AFB (San Antonio) Texas
Wright-Patterson AFB (Dayton) Ohio

This pilot program is an adjunct to the AFOSR Summer Faculty Research Program (SFRP).

APPLICATION DEADLINE: February 28, 1986

Selection Notification by 15 April 1986

OVERVIEW

The Air Force Office of Scientific Research, the Air Force Aerospace Medical Research Division, and Universal Energy Systems, Inc., initiated a pilot Air Force AMD Scholar Research program beginning in the Fall of 1985. This new program was an adjunct effort to the U.S. Air Force Summer Faculty Research Program (SFRP). This pilot program provided research opportunities for selected Engineers and Scientists holding a doctoral degree to work with the Air Force Aerospace Medical Division for a one year research period at one of the laboratories under the Aerospace Medical Division.

To be eligible, candidates must have a Ph.D. or equivalent in an appropriate technical field. The scholars were selected from such fields as Human Perception, Human Performance, Biochemistry, Toxicokinetics, Artificial Intelligence, and Neurosciences. The applicants were U.S. citizens, holding an appropriate advanced graduate research degree.

The Air Force Scholar in this program has the following specific obligations:

1) To participate in advanced research programs at the appropriate Air Force Aerospace Medical Division Laboratory.

2) To prepare a report at the end of the one year appointment describing their research accomplishments. This report will be approved by the Air Force Aerospace Medical Division.

3) To complete an evaluation questionnaire on the Air Force Aerospace Medical Division Scholar Research Program.

PROGRAM OBJECTIVES;

(1) To provide a productive means for Scientists and Engineers holding Ph.D. degrees to participate in research at the Air Force Aerospace Medical Division Laboratories;

(2) To stimulate continuing professional association among the scholars and their professional peers in the Air Force;

(3) To further the research objectives of the United States Air Force; and

(4) To enhance the research productivity and capabilities of Scientists and Engineers especially as these relate to Air Force technical interests.

PREREQUISITIES FOR APPOINTMENTS: To be qualified for consideration as an AMD Scholar in the Fall 1985 prog am, the applicant must:

(1) be a U.S. Citizen;

(2) be the holder of a Ph.D. degree, or equivalent, in an appropriate technical specialty; and

(3) be willing to pursue research work of limited time duration at the Air Force AMD Laboratories.

Although it is anticipated that the research itself may be unclassified, the Scholar must hold or be eligible for a Department of Defense SECRET clearance in order to insure access to work areas.

RESEARCH PERIOD: The period of this appointment is for one year starting in the summer of 1986, with a possible one-year extension.

FINANCIAL TERMS: The stipend for the Air Force AMD Scholar in this program is as follows:

One year research effort compensation of $34,000.

Travel expenses will be reimbursed for one trip from the Scholar's normal location to the Air Force facility at the start of the appointment; and one return trip from the Laboratory to the Scholar's normal home base at the end of the appointment period. This travel will be reimbursed in accordance with Universal Energy Systems, Inc. travel policy.

RESEARCH LOCATION: For the efforts contemplated, the AMD Scholars will be located at one of the following locations:

Air Force Human Resources Laboratory at Brooks AFB (San Antonio) TX

USAF School of Aerospace Medicine at Brooks AFB (San Antonio) TX

Harry G. Armstrong Aerospace Medical Research Laboratory at Wright-Patterson AFB (Dayton) Ohio

TECHNICAL PROGRAM TOPICS

There are many technical areas for study which fall within the purview of the Air Force Aerospace Medical Division (AMD). The research and development responsibility of AMD is to effectively integrate the human operator within the wide spectrum of Air Force systems and missions. These "human-centered" efforts span the full spectrum of research and development ranging from basic research through engineering development and are conducted via contract or within unique in-house facilities which allow real world Air Force environments to be simulated in the laboratory setting with the human operator as the central focus.

A list of technical tasks of present interest for scholarly research are noted below. These areas are planned or currently active with high priority, and provide an indication of the breadth and scope of the laboratory activity of interest for this program.

(1) Human Perception and Performance
   a. Visual perceptual and information requirements of humans
   b. Motion perceptual and information requirements of humans
   c. Performance and active control capabilities
   d. Psychophysical assessment of visual cues
   e. Visually risky environments encountered by pilots

(2) Biochemistry and Toxicokinetics
  a. Epigenetic mechanisms of chemical carcinogenesis
  b. Physiological uptake models for skin and gut

(3) Artificial Intelligence
  a. Integrated expert system for training and job-aiding
  b. Intelligent computer-assisted instruction
  c. Intelligent coaching systems
  d. Computational linquistics
  e. Cognitive processes

(4) Neurosciences
  a. Neurophysiology - auditory, vestibular, or visual functions
  b. Neurochemistry-neurotransmitter interactions
  c. Biomedical Engineering - visual and vestibular oculomotor functions
  d. Biophysics - IR pumping of vibrational states of Opsin.

AIR FORCE AEROSPACE MEDICAL DIVISION
ORGANIZATION OVERVIEW

There are three Air Force Aerospace Medical Division organizations participating under this program. These are:

Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL) at Wright-Patterson AFB (Dayton) Ohio

Air Force Human Resources Laboratory at Brooks AFB (San Antonio) Texas

United States Air Force School of Aerospace Medicine (USAFSAM) at Brooks AFB (San Antonio) Texas

A brief overview of the activities and responsibilities of the organizations follows. This discussion illustrates the breadth and scope of technical work in the organization.

AEROSPACE MEDICAL DIVISION (AMD)

Background Information

The Aerospace Medical Division (AMD), headquartered at Brooks AFB Texas, is a major Air Force Systems Command (AFSC) organization composed of several diverse organizations with varying missions. These missions include operation of the Wilford Hall USAF Medical Center at Lackland AFB Texas, field consultation services through the Occupational and Environmental Health Laboratory (OEHL), Brooks AFB, conduct of specialized biomedical education through the USAF School of Aerospace Medicine (USAFSAM), Brooks AFB, and research and development. All research and development programs are the responsibility of the AMD Deputy Commander for Research, Development and Acquisition and are managed through the USAF School of Aerospace Medicine (USAFSAM), the

Harry G. Armstrong Aerospace Medical Research Laboratory (AAMRL) at Wright-Patterson AFB Ohio, the Air Force Human Resources Laboratory (AFHRL) headquartered at Brooks AFB, and the AMD Directorate of Systems Acquisition (AMD/RDS) also at Brooks AFB.

The research and development responsibility of AMD is to effectively integrate the human operator within the wide spectrum of Air Force systems and missions. These "human-centered" efforts span the full spectrum of research and development ranging from basic research through engineering development and are conducted via contract or within unique in-house facilities which allow real world Air Force environments to be simulated in the laboratory setting with the human operator as the central focus.

1) HARRY G. ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY (AAMRL)

The Armstrong Aerospace Medical Research Laboratory's mission is to conduct behavioral and biomedical research to define the limits of human tolerance and the degradation of human performance under the conditions of environmental stress associated with aerospace operations. Results of these scientific efforts are published as technical reports, articles in scientific journals, handbooks, military specifications, and occasionally as scientific textbooks or chapters in academic textbooks. Further responsibility lies in establishing design criteria and new biotechnology techniques for future aerospace systems to protect and sustain personnel in any conceivable Air Force operational situation. The Laboratory also provides technical assistance to other federal agencies consistent with Air Force mission requirements and availability of resources.

To provide the most efficient operating structure, AAMRL is organized into five divisions. The three research divisions - Biodynamics and Bioengineering, Human Engineering, and Toxic Hazards - make major contributions to the AMD Biotechnology Program. The other two divisions - Veterinary Sciences and Technical Services - perform diverse support activities in animal care, their proper use and handling; administration, maintenance and material, resource management, and plans and programs.

The Laboratory's collocation with the Aeronautical Systems Division (ASD), Air Force Wright Aeronautical Laboratories, Air Force Institute of Technology, and affiliation with the Wright State University Medical Program fosters close working relationships among the medical and research disciplines represented. The proximity of the Laboratory and the ASD System Program Offices allows close coordination to resolve mutual problems involving integration of biotechnology inputs to new aerospace systems.

a) HUMAN ENGINEERING DIVISION (HE)

There is an increasing awareness that it is man's performance that distinguishes the mediocre system from the outstanding one - that distinguishes success from failure. Whether or not man's performance can meet the operational challenge depends to a large extent on the degree to which the system is designed to take maximum advantage of man's capabilities. The programs of the Human Engineering Division are aimed at learning more about man's physical and mental performance capabilities as an element in modern complex systems. The objective is to provide information for design engineers to integrate man and his capabilities into the system in a manner that will maximize total system effectiveness.

The Human Engineering Division is supported by a variety of complex special purpose facilities unique to the scientific community. To accomplish its mission of designing and quantifying performance of visual systems, an image metrics laboratory provides full capability for both the quantification of visual/display stimuli, as well as for measuring the human psychophysical response mechanisms. Research in the areas of decision-making, man-centered systems, systems simulation, and computer graphics is supported by a tailored digital computational/simulation system. In addition, the program to enhance operator performance in strategic offensive and defensive systems has required the development of special-purpose simulators that permit complete mission simulation for the B-52G/H strategic aircraft defensive and offensive systems crews. Other significant research tools include a variety of simulators: the roll axis tracking simulator (RATS), capable of rotation and oscillation about the longitudinal axis of its gondola; multi-axis tracking simulator (MATS), capable of motion in the roll and yaw axis, combined with motion along a horizontal, circular track; the manned threat quantification (MTQ) simulator, which functionally duplicates the performance of selected threat anti aircraft systems; and a sophisticated television tracking simulator.

b) TOXIC HAZARDS DIVISION (TH)

The Toxic Hazards Division has the sole responsibility within the Air Force to identify and quantitate toxic hazards created by chemical environments characteristic of advanced Air Force systems and operational situations. The ultimate purpose of the research program is to provide valid medical guidelines for the prevention of and protection against such health hazards as may be encountered by Air Force personnel in the performance of their military duties.

To understand and properly evaluate the health hazards peculiar to a certain chemical compound, its pharmacological properties and the pathways of metabolism, absorption, distribution and excretion must be investigated, the type and magnitude of pathology must be established, and diagnostic and therapeutic methodology must be developed. Based on these parameters, tolerance criteria can be recommended for personnel who handle or are otherwise in contact with such compounds.

The Toxic Hazards Division includes a nationally recognized capability for inhalation toxicology centered around eight unique exposure chambers called Thomas Domes. These domes are large glass-paneled structures, 12 feet in diameter and 9 feet high, which permit unrestricted visual and photographic observation of experiments in progress. The domes have an altitude capability and are air-locked to permit entry during long, continuous exposures without disturbing the exposure parameters. These design features make them excellently suited for handling highly toxic and suspect carcinogenic chemicals. The exposure facility includes numerous other commercial chambers and has associated with it a hands-off gas mixing facility used to generate and maintain precise concentration levels of hazardous materials common to the missile industry.

2) <u>AIR FORCE HUMAN RESOURCES LABORATORY (AFHRL)</u>

The Air Force Human Resources Laboratory is the principal AFSC organization charged with planning and executing the USAF exploratory and advanced development programs for research related to manpower and personnel, manned aircraft simulation, logistics, and technical training. Manpower and personnel research addresses selection, classification, assignment, evaluation, and retention of Air Force members and overall force structure and utilization. Manned aircraft simulation includes training technology for simulators and other instructional devices, the development of devices and technology for training air combat tactics, and advanced systems to improve the quality and combat effectiveness of aircrews. Logistics research studies logistics factors at each step in the development and acquisition of systems and the productivity of maintenance personnel in operational environments. Technical training addresses the development of improved methods for training including content, instructional strategies, delivery, and management.

a) <u>TRAINING SYSTEMS DIVISION (ID)</u>

The Training Systems Division is developing technology to guide in the design and acquisition of computer-based training management and delivery systems applicable to both "schoolhouse" and "on-the job" training. At more fundamental levels, it is developing technology for relevant skill and performance specifications, as well as for technology for applications of artificial intelligence in technical and maintenance training and performance.

The program involves major projects on standardized computer-based-instruction (CBI) software and maintenance simulation for training. The CBI software efforts are joined into a joint-Services R&D project with the common goal of providing a library of transportable, user-friendly, menu-driven, machine-independent, modularized, course-authoring CBI software, in Ada, for use by all the military Services. This effort also has numerous technology-transition projects. The maintenance simulation efforts are developing technical reports and guides or specifications for the design, acquisition, and use of maintenance simulators for training. Three additional areas within the

project are in their formative stages. Specifically, these are (a) Integrated Training System, (b) Manpower, Personnel, and Training Integration Technology, and (c) Application of Artificial Intelligence to Air Force Training efforts.

3) USAF SCHOOL OF AEROSPACE MEDICINE (USAFSAM)

The USAF School of Aerospace Medicine has the responsibility to support and enhance Air Force Capabilities and Operations through programs across the spectrum of aerospace medicine, education, and research and development. This mission is accomplished by conducting postgraduate education programs in clinical medicine, aerospace medicine and related fields, preventive medicine, and technical education in support of the United States Air Force mission objectives.

The School also provides medical evaluation and consultation services for flying personnel with difficult, obscure, or borderline medical problems that affect their flying status. Operational support is provided to Air Force commands and other Government agencies within the scope of on going research and development, education, and medical evaluation and consultation programs.

The USAFSAM research and development program involves the areas of: (1) Aerospace Medicine encompassing aircrew maintenance, selection, and retention criteria; risk factor identification/modification; and aeromedical data bases. (2) Radiation Hazards in Aerospace Operations which includes acute and chronic radio frequency radiation (RFR) exposure bioeffects; laser effects on AF personnel; performance effects of particulate radiation exposure; and nuclear aircrew vulnerability. (3) Advanced Crew Technology incorporating aircrew stress and fatigue investigations and in-flight assessment of the cockpit environment; development of advanced tactical aircraft; and development of crew protective equipment (altitude and thermal); and (4) Aerospace Biotechnology for Chemical Warfare Defense which includes individual protection; detection and warning; laboratory and field testing of equipment or techniques; and medical equipment development.

a) CLINICAL SCIENCES DIVISION (NG)

Modern high-performance aircraft pose new and challenging problems with regard to the man-machine interface in the aerospace environment and man's ability to function properly regardless of visual or other medical stimuli encountered. The Clinical Sciences Division is involved in evaluating and solving these problems from four different perspectives: (1) Aeromedical evaluation through the USAF Aeromedical Consultation Service to ensure the selection of the right person for the right job, thus preserving the integrity of the present and future Air Force flying force. (2) Direct and indirect input of aeromedical problems and their solution into the education and training of flight surgeons who will be performing health maintenance for rated personnel in the field. (3) Performance of aeromedical research directed toward solving or modifying medical problems encountered in Air Force flyers, thus preserving the investment of the Air Force in the rated force.

(4) Provision of aeromedical support to the field by responding to requests for information from flight surgeons at Air Force bases and organizations throughout the world; by the serial comparison of electrocardiograms obtained on rated crewmembers; and by assisting in the refining of medical standards for selection and retention for flying training.

AMD PROGRAM SUMMARY

UES prepared a brochure describing the AMD Scholar program and application forms. Approximately 5000 of these were mailed to the Colleges and Universities throughout the United States. The brochure was provided to the participating AMD Laboratories for distribution. A total of 14 applications were received. Six offers of position were made. Three were accepted. There are currently 4 participants on the program. The technical effort is scheduled to be completed by March 1988.

The following is a summary listing of the AMD Fellows and their current status.

1. James R. Jauchem
   Mentor: James W. Wolfe
   Location: SAM, Brooks AFB, Texas
   Topic: Radiation Physics
   Start: March 2, 1987
   Completion: February 29, 1988

2. Donald J. Polzella
   Mentor: Charles Bates
   Location: AAMRL, Wright-Patterson AFB, OH
   Topic: Perception and Performance
   Start: August 16, 1986
   Completion: August 15, 1987, final report approved

3. Paul Werchan
   Mentor: James W. Wolfe
   Location: SAM, Brooks AFB, TX
   Topic: Cerebral Bloos Flow During High Sustained $+G_z$ or High Onset of $+G_e$ in the Baboon
   Start: September 2, 1986
   Completion: Sept. 2, 1987, final report approved.

4. Bertram Klauenberg
   Mentor: James W. Wolfe
   Location: SAM, Brooks AFB, TX
   Topic: Biological Effects of Microwaves
   Start: January 5, 1987
   Completion: January 4, 1988

VIII. HIGH SCHOOL APPRENTICESHIP PROGRAM (HSAP)

As part of the Special Studies section of the Summer Faculty Research Program, UES initiated an Air Force High School Apprenticeship Program in 1986. The purpose of the program was to place highly qualified and highly motivated high school students in the Air Force Laboratories for orientation and training in science and engineering. UES provided the recruiting, selection, and management to start up the Air Force HSAP. Much of the program development was based on the successful Army High School Program and material prepared under the contract to the Department of the Army by the National Institute for Work and Learning. To accomplish this effort, UES followed the schedule presented in Table 1. There were 42 High School students participating in the 1986 program and 73 High School students participating in the 1987 program.

TABLE 1
AIR FORCE HIGH SCHOOL
APPRENTICESHIP PROGRAM

Calendar of Activities

December	o	Identify schools and laboratories for participation
	o	Prepare informational material for schools and installations application forms for students and mentors, and covering letters.
	o	Disseminate information
	o	Recruit apprentices, mentors
January	o	Send student applications to teachers
February	o	Applications with teacher recommendations
	o	Receive mentors' project descriptions and student requirements
	o	Make preliminary selection of students for referral to mentor
March	o	Make preliminary matching of students with mentors; send letters with several student applications to each mentor
	o	Mentors interview students, inform UES of choice
April	o	Send letters of placement to students, with acceptance forms to be signed by them and parents and returned to UES
	o	Place 2nd year apprentices (Eglin and Hanscom only)
	o	Make final matches
	o	See that security clearances are started, where applicable
	o	(Mentors provide background reference material to chosen apprentices)
	o	Encourage enrichment activities: arrange for films, speakers, tours, ect.
May	o	Send letters to students and mentors re-opening session
	o	Send students Apprentice Handbook
June	o	Arrange general orientation for students and mentors
July, August	o	Administer and monitor apprenticeships
	o	Check on enrichment activities
	o	Distribute evaluation forms to students and mentors
September	o	Analyze evaluations
	o	Prepare final report to Air Force

In the near future the United States may face shortages of scientists and engineers in such fields as physics, electronic engineering, computer science, and aeronautical engineering. High school students are currently not selecting to prepare for careers in these areas in numbers large enough to match the projected need in the United States.

The Air Force faces "a formidable challenge - the acquisition and retention of the technological competence needed to ensure a strong national security, both in-house and in the industrial and academic base which supports defense preparedness." The Director of the Office and Science of Technology Policy in the Executive Office of the President in 1979 responded to this need by requesting the federal agencies to incorporate in their contract research programs the mechanisms to stimulate career interests in science and technology in high school students showing promise in these areas. The Air Force High School Apprenticeship Program is an example of the response to this.

Under this program, UES placed the selected high school students in a wide variety of scientific and engineering fields at the participating Air Force Laboratories/centers. The students worked for an eight-week period during their summer vacations. UES provided all the support and administration to advertise the program, coordinate applications with the Air Force Laboratory mentors, made final selection of student-mentor matches for the summer, made payment to the students during their working period, and collected and coordinated the final reports from the students.

The Laboratories participating in the program, along with the number of high school students assigned to the laboratory is listed below.

Laboratory	Students
Aero Propulsion Laboratory Dayton, Ohio	2
Armament Laboratory Fort Walton Beach, Florida	16
Avionics Laboratory Dayton, Ohio	6
Engineering and Services Center Panama City, Florida	11
Flight Dynamics Laboratory Dayton, Ohio	6
Geophysics Laboratory Boston, Massachusetts	3
Harry G. Armstrong Aerospace Medical Research Laboratory Dayton, Ohio	6

Human Resources Laboratory: Manpower and Personnel Division San Antonio, Texas	0
Human Resources Laboratory: Manpower and Personnel Division San Antonio, Texas	0
Human Resources Laboratory: Operations Training Division Phoenix, Arizona	0
Occupational and Environment Health Laboratory San Antonio, Texas	1
Rocket Propulsion Laboratory Lancaster, California	12
Rome Air Development Center Rome, New York	6
School of Aerospace Medicine San Antonio, Texas	4

There were a total of 73 participants in the program selected from 258 High School student applicants. The final report on the High School Apprenticeship Program is published under a separate report entitled United States Air Force High School Apprenticeship Program 1987 Program Management Report.

APPENDIX I

This appendix presents the following documents which were distributed to appointees and other program participants.

A. Information Brochure for Summer Fellows.

B. Questionnaire for participants and a summary of their replies.

C. Questionnaire for Air Force laboratory representative and a summary of their responses.

D. Questionnaire for participants research colleagues and a summary of their replies.

APPENDIX 1.A

INFORMAION BROCHURE

for

SUMMER FELLOWS

on the

1987 USAF-UES SUMMER FACULTY RESEARCH PROGRAM

March 1987

TABLE OF CONTENTS

I. SUMMER FELLOW OBLIGATIONS

Universal Energy Systems, Inc. (UES) is required by contract to impose certain obligations on you in your status as a Summer Fellow. This section outlines those obligations, and you should read them thoroughly. Your are required to sign and return the statement of understanding before the final processing of your appointment can be completed. The following is a list.

1. Pre-Summer Visit: A pre-summer visit to your research location is optional but has been of great value to previous participants in planning the summer research effort. Approval for such a trip may be granted upon written request to UES along with the concurrence of the Laboratory/Center respresentative. The purpose of this visit is to enable you to make your final plans for the summer research period if needed. Reimbursement is paid for allowable travel expenses incurred on a pre-summer trip as indicated in the Allowable Travel Expenses section (page 3) of this brochure. To be reimbursed, you must invoice for it as described in the Instructions for Invoicing for Compensation and Reimbursement section (page 5) of this brochure.

2. Research Goals and Objectives: A statement of research objectives must be provided to UES PRIOR TO the start of the summer research period. It should outline your goals and the approach you intend to follow in researching these goals. Neither travel expenses nor expense allowances will be reimbursed until after receipt of your statement of research objectives. The report should also clearly indicate the date of your first working day of the summer research period.

3. Final Report: At the end of your summer research effort, you are required to submit to UES a completed, typewritten scientific report stating the objectives of the research effort, the approach taken, results, and recommendations. Information on the required report format will be sent to you with a "FINAL REPORT INFORMATION BULLETIN" and sample report illustrating a suggested format. The final report must first be approved by your Effort Focal Point and then transmitted so as to reach UES by Wednesday, September 30, 1987. Payment of "Compensation" for the final two weeks of your ten-week research period cannot be made until UES has received and approved this report in the required format.

4. Program Evaluation Questionnaire: This critique form should be completed and returned to UES, along with your final report, by Wednesday, September 30, 1987. The return of this form is a program requirement; it also must be received by UES before the final compensation payment can be made.

5. <u>U.S. Air Force - Summer Fellow Relationship</u>: The U.S. Air Force and UES understand and agree that the services to be delivered by Summer Fellows under this contract will be non-personal services and the parties recognize and agree that no employer-employee or master-servant relationships will exist between the U.S. Air Force and the Summer Fellows. Non-personal services are defined as work performed by an individual who is responsible for an end item, such as a report, free of supervision of the U.S. Air Force and free of an employer-employee relationship.

As a Summer Fellow, you will not:

(a) Be placed in a position where you are appointed or employed by a Federal Officer or are under the supervision, direction, or evaluation of a Federal Officer, military or civilian.

(b) Be placed in a staff or policy-making position.

(c) Be placed in a position of command, supervision, administration, or control over Air Force military or civilian personnel or personnel of other contractors or become a part of the U.S. Air Force organization.

The services to be performed under the SFRP do not require UES or the Summer Fellow to exercise personal judgement and discretion on behalf of the U.S. Air Force; rather, the Summer Fellows will act and exercise personal judgement and discretion on their research programs on the SFRP conducted by UES.

The Air Force will have unrestricted use of and access to all data developed during the period of this appointment.

II. ALLOWABLE TRAVEL EXPENSES

If you live outside of the area (50 miles) where you will be assigned for the summer program, the SFRP provides potential funding for two trips between your home and your assigned research location. As soon as you have signed and returned your appointment letter along with the budget sheet, you will be authorized to receive reimbursement for travel expenses as described below.

As outlined in the Summer Fellow Obligations section in this brochure, you may make a pre-summer visit in addition to the trip to and from your assigned research location for your summer effort. You are expected to make your own arrangements for these trips, and after the trips you may invoice UES for reimbursement of allowable expenses in the format described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure. Closely coordinate your travel plans with your FOCAL POINT.

All travel reimbursements under Summer Fellow appointments are made according to current UES policy, and deviations from the approved budget are not authorized and will not be reimbursed. In light of these restrictions, you may choose either to travel by common carrier at coach rates or less, by driving your private auto, or by a combination of both. (Please note that funding for rental cars requires ADVANCED WRITTEN approval by UES and UES will not reimburse this expense unless the prior written approval is obtained.) With any of these choices you may claim reimbursement up to the amount for the most direct routing, taking into the account the desirability of routing on interstate highways if you drive your private auto.

Reimbursement for direct route travel by common carrier will be paid on your submission of an invoice to UES following the invoicing instructions referenced above. In the view of the convenience of having a car at the research location, UES strongly recommends that a private auto be used for travel when practical. Reimbursement when you drive your private auto is at the rate of 20¢ per mile within the above routing restrictions and will be paid on submission of a suitably prepared invoice. These reimbursements cannot be extended to cover travel by your family if they accompany you on either of these authorized trips.

During the pre-summer visit, you will be authorized to claim a per diem reimbursement at the rate of $55.00 per day for a maximum of three days spent at your assigned research location outside of your area of residence. Instructions for claiming this per diem are also described in the Instructions for Invoicing for Compensation and Reimbursement section of this brochure.

During the ten week summer research period, you will be authorized to receive an expense allowance in lieu of a per diem payment at a rate of $41 per day for a maximum of 70 days. To receive this allowance, you must invoice for it and be living (50 miles) outside your area of residence.

These items above are the only reimbursable travel allowances authorized under the SFRP appointment. Any additional travel expenses incurred during the appointment period will be your personal responsibility.

UES has arranged with a travel office in Dayton, Ohio, to have the Air Fare costs of your travel on the SFRP charged directly to UES. For you to take advantage of this you must call this travel service. The number in Dayton, Ohio, is 293-7444 or 1-800-628-6668. You must give the code SLI3 to have the tickets charged to UES. Please reference project 760 when ordering tickets.

III. INSTRUCTIONS FOR INVOICING FOR COMPENSATION AND REIMBURSEMENT

Attached is a copy of the Invoice Format that you are required to use to obtain compensation or reimbursement from UES. Note that all disbursements by UES for compensation, travel, and/or other expenses are subject to audit approval, so you must submit receipts substantiating charges invoiced.

In addition, you must prepare, sign, date and attach to each completed invoice a Brief Report of Effort

A. PREPARATION OF BRIEF REPORT OF EFFORT

Whenever you submit an Invoice for reimbursement to UES you must also include a brief report describing your activities for the invoice period. To meet this obligation, you must prepare, date, sign, and attach to your completed invoice a Brief Report of Effort describing the research accomplished on the appointment and explain any travel during the invoice period.

This report should describe innovative techniques and designs or discoveries which may be disclosed as patents. Rights to any inventions or discoveries shall reside with UES unless determined otherwise by the contracting agency.

The Brief report should never exceed one typewritten page and most often should be considerably shorter than one page.

B. PREPARATION OF INVOICE FORMAT

The financial items required on the Invoice Format are for COMPENSATION, TRAVEL, EXPENSE ALLOWANCE, AND PER DIEM.

Item (1) SOCIAL SECURITY/MAILING ADDRESS

Fill in your name, social security number, and address to which you wish to have your check mailed.

Item (2) COMPENSATION

(a) Indicate the dates for which you are claiming compensation, and indicate the number of days you are claiming for compensation, this may include holidays, such as July 4.

(b) Multiply this number by $120.00 and enter the total dollar amount in the blank total charges for service. The accumulated total number of days you claim on this appointment may not exceed the number authorized in your appointment letter.

Item (3) TRAVEL

(a) Under the heading Date indicate the date you departed on your trip and the date you arrived at your destination. If you are invoicing for a round trip, also list the date you departed on your trip and the date you arrived home.

(b) Under the heading Dept/Arrival Time list the departure and arrival times for the corresponding days you listed under Date.

(c) List your destination under the heading Destination.

(d) Under the heading Mode, indicate your principal means of conveyance; i.e., commercial air, private auto, etc

(e) Under the heading Amount, itemized these expenditures for travel reimbursement. Continue them on a separate sheet if necessary.

(f) Total these travel items and enter the dollar amount for travel in this invoice on the line to the right of Total Travel Expense.

Item (4) EXPENSE ALLOWANCE

This item on the invoice will be used to claim the $41 per day for reimbursement of per diem.

(a) In the first blank to the right of EXPENSE ALLOWANCE enter the number of days for which you are claiming the expense allowance at your assigned research location.

(b) Multiply this number by the daily allowance rate of $41.00 and enter this total dollar amount in the blank at the far right.

(c) Itemize the days for which you are claiming the Expense allowance reimbursement. It can include weekend days and holidays as well as regular work days. It does not apply to the pre-summer visit.

Item (5) <u>PER DIEM</u>

This item will be used to claim reimbursement <u>only</u> for Per diem charges on the optional <u>pre-summer visit</u>. This cannot exceed three days; only days spent at the actual research site are allowed.

(a) In the first blank to the right of PER DIEM enter the number of days reimbursement being requested. This entry must correlate with an accompanying lodging receipt.

(b) Multiply this number by the $55.00 daily Per diem rate and enter the total dollar amount in the blank at the far right.

Item (6) <u>INSTRUCTIONS</u>

You may combine reimbursement requests for compensation, travel, and Per diem or expense allowance in the same invoice. The total for all items invoiced should be indicated on the blank labeled "Total Amount of Bill" in the lower right hand side of line 6.

Item (7) If you have arranged your travel through the UES travel office as described on page 4, please indicate the cost of the tickets on this line.

IMPORTANT: Indicate in the space provide on <u>each</u> invoice the address to which you want the check mailed.

You must sign and date your invoice in the space provided as "Summer Fellow" before it is submitted; you MUST also have your <u>Focal Point countersign</u> the invoice before it is mailed to UES. Your Focal Point is an Air Force individual at your research location who will be identified prior to your effort start date.

Invoices should be mailed to:

Universal Energy Systems, Inc.
SFRP Office
4401 Dayton-Xenia Road
Dayton, Ohio 45432

IV

BILL FOR SERVICE

1. ______________________________ ______________________
Name (First, Initial, Last) Social Security #

____
Address (Street, City, Zip)

SERVICE: SFRP Summer Fellow

SERVICE AUTHORIZED BY: Rodney C. Darrah RATE AUTHORIZED: $120.00/day

This service is for:

Government Contract: Project # 760
Government Contract No. F49620-85-C-0013

2. DATES OF SERVICE: ______________ TOTAL DAYS OF SERVICE ____

TOTAL CHARGES FOR SERVICE: ____________

ADDITIONAL ITEMIZED REIMBURSABLE EXPENSES:
(receipts required for expenditures over $25.00)

3. TRAVEL: DATE ______________ DEPT/ARRIVAL TIME __________

DESTINATION MODE ______________ AMOUNT ______________

4. EXPENSE ALLOWANCE: (____ days at $41.00/day) $__________

5. PER DIEM: (____ days at $55.00/day) (Pre Summer Visit) $__________

6. TOTAL AMOUNT OF BILL: ______________

7. AIR FARE TICKETS CHARGED DIRECTLY TO UES AMOUNT $__________

______________________________ ______________
Summer Fellow Signature - Date Telephone

Invoice Approval: ______________________________
Effort Focal Point Signature

X______________________________ Brief Report of Effort
Type or Print Name Attached __________

Location: ______________________

Telephone: ______________________

Date: ______________________

Send bill to:
UNIVERSAL ENERGY SYSTEMS, INC.
ATTN: SFRP Office
4401 Dayton-Xenia Road
Dayton, Ohio 45432

In order for UES to provide quick turn around of your bills for service, we request your assistance in complying with the following schedule. The dates indicated are the dates your bills MUST be at UES. Please allow adequate mailing time for UES to receive your bills by the dates indicated for 1987

April 6, 20
May 4, 18
June 1, 15, 29
July 13, 27
August 10, 24
September 7, 21
October 5, 19

For bills received on or before these dates, UES will be able to process checks to you in the mail by the following Thursday. For bills received after these dates, the checks may not be processed until the next pay period, causing a two week delay in your receiving your check.

Your bill may be for any period of time. It does not have to start on a Monday or end on a Friday. Your bill may be for any period convenient for you to meet our billing dates listed above. Please note these are the dates the bill must be at UES. For example, a bill received on or before April 6 will be mailed out to you on April 10. A bill received on April 7 will not be mailed until the April 21 bills are processed on April 24.

1987-88 RESEARCH INITIATION PROGRAM

As a participant in the 1987 Summer Faculty Research Program (SFRP) you are eligible to submit a proposal for the AFOSR RIP Program, as discussed in the 1987 SRFP Program Brochure.

To compete for a RIP Program award SFRP participants must submit a complete proposal and proposed budget either during or promptly after their SFRP appointment period. Each proposal will be evaluated for technical excellence, with a special emphasis on relevance to continuation of the SFRP effort, as determined by the Air Force Laboratory/Center. The most effective proposals are those closely coordinated with the SFRP Effort Focal Point and which follow the SFRP effort with proposed research having strong prospects for later sustained funding by the Air Force Laboratory/Center.

The maximum award under the RIP Program is $20,000 plus cost-sharing by your University/College.

The total funds available from AFOSR will limit the number of awards to approximately 75, or one-half of the 1987 SFRP participants. The final decision on funding a proposal is the responsibility of AFOSR.

The mechanics of applying for a RIP Program award are as follows:

(1) Program proposals for $20,000 plus cost-sharing must be submitted no later than November 1, 1987. Budgets must include, where applicable, Principal Investigator time, graduate assistant and support effort, equipment and expendable supplies, travel and per diem costs, conference fees, indirect costs, and computer charges. No special format is required, however cost sharing must be indicated on the budget if applicable.

(2) Proposals are evaluated and a final award decision is recommended by AFOSR after consultation with the Laboratory/Center.

(3) Subcontract awards will be negotiated with the employing institution, designating the individual as Principal Investigator, with the award period having a start date no earlier than October 1, 1987 and a completion date no later than December 31, 1988. The performance period of the research may not exceed one year. Employing institutions are encouraged to cost-share since this Program is designed specifically as a research initiation procedure.

In summary, a RIP Program proposal must be:

Technically excellent;
A continuation of SFRP work:
Received no later than November 1, 1987
Budgeted not to exceed $20,000 plus cost-sharing
Less than one year duration.

Proposals for the RIP Program should be transmitted to UES as soon as possible. Some awards may be made prior to the submission deadline. The first RIP awards are planned to be in effect during the month of December 1987. All awards are expected to be in effect shortly after the final submission deadline of November 1, 1987, with final negotiation with your University completed by January 1, 1988.

Send completed proposals to:

RESEARCH INITIATION PROGRAM
Universal Energy Systems, Inc.
4401 Dayton-Xenia Road
Dayton, Ohio 45432

APPENDIX 1.B

PARTICIPANT'S QUESTIONNAIRE & REPLY SUMMARY

1987 USAF/UES SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE

(TO BE COMPLETED BY PARTICIPANT)

Name______________________________Title______________

Dept. (at Home)___________________Home Institution____________

Research Colleague_____________________________________

Laboratory Address of Colleague________________________

Brief Title of Research Topic__________________________
____

A. TECHNICAL ASPECTS

1. Was the offer of research assignment within your field of competency and/or interest? YES_____NO_____

2. Did you have a reasonable choice of research assignment? YES____ NO_____
If no, why?____

3. Was the work challenging? YES_____NO_____. If no, what would have made it so?_______________________________________

4. Would you classify your summer effort as research? YES_____NO_____
Comment:____

5. Were your relations with your research colleague satisfactory from a technical point of view? YES_____NO_____ if no, why?____________
____
____

6. Suggestions for improvement of relationship.______________
____
____

7. Considering the circumstances of a summer program, were you afforded adequate facilities and support? YES_____NO_____ If no, what did you need and why was it not provided?________________________________

____

8. Considering the calendar "window" of ten weeks, limited by various college and university schedules, please comment on the program length. Did you accomplish: more than_____;
less than_____;
about what you expected_____?

9. Do you think that you will continue this or related research efforts upon returning to your home institution by applying for a Mini Grant or other funding? YES______NO______ Give a brief explanation of your plans.____

____

10. Were you asked to present seminars on your basic expertise of work? YES______NO_____ Please list number, dates, approximate attendance, length of seminars, title of presentations.

11. Were you asked to participate in regular meetings in your laboratory? YES_____NO_____ If yes, approximately how often? __________

____

12. Did you perform travel on behalf of the laboratory? YES_____NO_____
Where to?____
Purpose?____

13. List any "special" meetings you may have attended or participated in, such as conferences, visiting lectures, etc.______________________

____
____
____

14. Other comments concerning any "extra" activities.________________

____
____

15. On a scale of A to D, how would you rate this program?

	A (High)	. . .	.	D (Low)
Technically challenging	A	B	C	D
Future research opportunity	A	B	C	D
Professional association	A	B	C	D
Enhancement of my academic qualifications	A	B	C	D
Enhancement of my research qualifications	A	B	C	D
Overall value	A	B	C	D

B. ADMINISTRATIVE ASPECTS

1. How did you first hear of this program?______________________________

____

2. What aspect of the program was the most decisive in causing you to apply?_______________________________________

____

3. Considering the time of year that you were required to accept or reject the offer, did this timetable cause you any problems of commitment? YES_____NO_____

4. After your acceptance, was the information on housing, location, directions, etc. supplied to you prior to the summer period satisfactory? YES_____NO_____

5. Did you have any difficulty in any domestic aspects such as, locating suitable housing, acceptance in community, social life, any other "off-duty" aspects? YES_____NO_____ If yes, please explain._______

____

____

6. How do you rate the stipend level? Meager______Adequate____ Generous_____.

7. How important is the expense-paid pre-program visit to the work site? Not worth expense_____ Convenient_____ Essential_____. Please add any other comments you may have.______________________________

____

____

8. Please give information on housing: Did you reside in apartment_______, VOQ_______, other (specify)______________? Name and address of apartment complex and manager's name.__________________

____

9. Please suggest names and give sources, of organizations, mailing lists or other information you think would be helpful in advertising next year's program.____

____

10. Do you believe the Graduate Student Program increased the effectiveness of this program? YES_____ NO_____.

11. Did a student work with you? YES______ NO_____ If so, please comment on the Graduate Student Support influence on your summer research.____

____

12. Considering the many-faceted aspects of administration of a program of this magnitude, how do you rate the overall conduct of this program? Poor_________ Fair________ Good________ Excellent________. Please add any additional comments.____

____

____

13. Please comment on what, in your opinion, are:

a. Strong points of the program:_________________________________

____

____

____

b. Weak points of the program:__________________________________

____

____

____

14. On balance, do you feel this has been a fruitful, worthwhile, constructive experience? YES_____ NO______

15. Other remarks:____

THANK YOU

1451s

QUESTIONNAIRE EVALUATION SUMMARY
(Participant)

1. Assignment in field of competency and/or interest? Yes - 158
No -

2. Reasonable choice of assignment? Yes - 156
No - 2

If no, why?

Only one offer was made which was consistent with my interests.

3. Work challenging? Yes - 157
No - 1

If no, why?

Initially, the choice was reasonable because I was under the impression that the technical focal point would be present for the duration of my project. The project required someone familiar with natural language processing and someone familiar with expert systems concepts. The technical focal point was to cover natural language as my area of expertise is expert systems. However, when it became evident that he would be leaving less than half-way into the project, I should have been informed and given the opportunity to change to a project which I was capable of completing without requiring my learning a whole new field of research.

4. Would you classify your summer effort as research? Yes - 157
No - 1

Comments:

Yes

Marginally, minigrant if obtained is moreso.

Not experiments, but research.

Since I am just beginning research in parallel processing, I did more learning and investigation in to the various aspects of parallel processing than actual state-of-the-art research.

Research and Development in equal portions.

I was able to begin research on a problem that is important and has been of interest to me for past several years.

Mostly literature reading, defining specific problem and direction of lab effort.

Not basic research, more applied research.

Challenging and rewarding, basic research with practical applications.

Engineering research rather than scientific research.

The problem I worked on was directly related to the type of research I had been conducting at Texas Tech.

Techniques used are still in exploratory stage in Computer Science.

Although, part of the time was sepnt in forming a general background.

However, considerable time was spent trying to repair nonfunctional instrumentation.

My summer effort also included symposium and conference development.

No

5. Were your relations with colleagues satisfactory? Yes - 154
No - 4

If no, why?

He was not sufficiently qualified in theoretical computer science or artificial intelligence to be of significant research assistance.

He did not have time to become involved with the research from a technical point of view.

He was so busy I rarely saw him.

Shortly after I arrived he announced he was leaving his position for employment elsewhere. As a result, he had too little time for interactions. A second colleague was subsequently found.

6. Suggestions for improvement of relationships.

During the time that he was present, he was so overwhelmed with administrative duties that he had little time to spend with me. This was particularly devastating to me as the initial project concept was his and I spent considerable time chasing up blind alleys.

As long as the technical focal point is swamped with administrative duties, there is no way to improve the relationship from the technical side.

Earlier in-depth discussions.

These were ideal relationships - free flow of information in both directions, unlimited use of resources. All lab personnel were very helpful and seemed to look on our work as important to their effort. I wouldn't change a thing!

It would have been helpful if he had more hands-on experience in the area of parallel processing. It would have been helpful to have had a resource person on site instead of having to do everything long distance at Argonne National Lab.

Provide for scheduling a seminar by the Fellow the the lab.

Increased informal activities.

Difficulty in communication was due to being physically remote from research group. However, my study was fairly independent and well-defined.

More technical discussion would be helpful.

Our offices were not in close physical proximity, so I didn't get to talk to him every day - unless I sought him out.

Improved communication on his and my part. This deficiency caused a major misunderstanding regarding whether I was working or not.

I would have liked to have seen more contact with the technical focal point. Since I didn't have a "regular" research job, I spent much of my time "outside" the group.

Would be helpful to have more experienced AFWAL people to work with.

Have him designate one of his senior personnel to give oversight to the Summer Faculty program.

It would be better if he were continuing in the laboratory, but he has gone away to do graduate work.

Better secretarial support for memoranda would have contributed to improved communications.

Site visitation at participating institution by collaborating USAF researchers.

Should pursue cooperative research with USAF Materials Laboratory and my institution.

More interaction helpful.

Relationship was very fruitful.

Technical interaction could be increased if the technical people at the lab were more involved in their own experiments and not only managing the projects of others.

Possibly two pre-summer visits of 2 days each in duration might be more useful.

Allow the program to go to 12-14 weeks for those who want it. In addition to a mini-grant, allow for funding to have individuals continue into autumn term.

Give research colleague some relief from managerial duties so he can devote more time to actual research.

A short weekly meeting might be beneficial.

Closer coordination between focal point and intern on exact content of Air Force requirement of the project.

My research colleague goes out of his way to help. He is always available for discussion and guidance.

Some funds for conducting research should be provided.

My colleague simply had too little time for summer research people.

My research colleagues at AEDC are simply excellent.

A written list of possible research avenues could be helpful. Also a list of people to see to accomplish day to day activities.

More frequent contact, participation in meetings more often.

Social events should be organized.

Schedule periodic colloquia.

Additional collaborative projects with the AFGL LID laboratory would be highly desirable. I enjoyed my working relationship with this group very much.

Early release of dates for protocal review annual use committee.

Require 2-3 pre-summer visits to ensure running start at beginning of summer.

It would be beneficial if the research colleague be given more time to take an active part in the research activity.

A sponsored social activity would aid in opening communication. This would be best during the first week and would not have to be too elaborate.

Very early presentation (informal) of ideas to all potential resource points - would save the very non productive effort at "selling" to the various departments in a one on one basis.

Some researchers at AFGL do not seem to be aware of faculty research program. A few other research workers felt that their involvement in their own research projects and activities did not leave them time to participate with visiting professors.

7. Were you afforded adequate facilities? Yes - 147
No - 11

If no, why?

Upon his departure, I was unable to secure adequate programming and typist help due to being forced to borrow work time from other lab personnel's assistants whenever they had some free time. No assistants had been preallocated to my project due to his scheduled leaving.

Very limited desk area, more air conditioning.

The parallel processor that was suppose to be available to me at AFWL is still in the procurement stage. The blame should probably be placed on what appears to be an incompetent staff in procurement at AFWL. He did his best to assist in my investigation this summer. He suggested using the Advanced Computing Research Facility at Argonne National Lab in Illinois and provided me with his account. He was always available for discussing, etc.

A major piece of equipment (a powerful laser) was delayed in delivery.

I preferred to use a software package I had access to at another university. The lab did not have the capability to access the computer system at this university.

Typing access (to secretary's time) and phone answering inadequate, was a nuisance. Everything else o.k.

There were problems in assigning monies to acquire things which were not routinely available at the labs.

The research facilities for environmental pollutants were not available.

Expendable supplies could not be acquired in time because of procurement delays.

Adequate support in the form of personnel to write software.

I would have appreciated more money - who would not?

8. Accomplishment in ten weeks?

More than expected	-	28
Less than expected	-	26
About what expected	-	104

9. Will you continue this or related research efforts?

Yes	-	143
No	-	15

10. Were you asked to present seminars?

Yes	-	85
No	-	73

11. Were you asked to participate in meetings?

Yes	-	99
No	-	59

12. Did you travel on behalf of the laboratory?

Yes	-	14
No	-	144

13. Did you participate in "special" meetings?

Yes	-	83
No	-	74

14. Please give other comments on extra activities.

Interactions with other SFRP fellows was especially beneficial. Also was briefed on other on-going AFHRL research programs.

Very nice of them to invite me to a couple of picinics, as well as a luncheon and dinner.

A tour of the base was given and various type of tests performed were explained.

The group was very good in that they never asked me to take part in bureaucratic meetings or tasks.

I aided in organizing an upcoming conference.

I found all the meetings I attended to be of use - both in content and philosophy.

I was sometimes asked to meet with visitors, attend in-house presentations, and seminars by visitors.

Took tour of Eglin AFB facilities for one full day. This was interesting.

In-house seminars and invited guest speakers on topics of superconductivity very informative.

Attended UES organized administrative social meeting.

Tour of Brooks AFB.

Enjoyed UES social.

Use of gym and swimming facilities at GAFD - child care facility.

It was necessary to make trips to the University of Texas Health Science Center for equipment and consultation.

Learned how parallel processors and superconductors work.

Collaborated with researchers at Medical College of Georgia and Morehouse College.

Participated in informative tour of Eglin AFB.

The quality of seminar speakers was excellent.

I was granted permission to visit the NATO test structure on numerous ocassions.

The trip to Ft. Bragg was very beneficial for my summer objectives.

Went on tours of the AFB, invited to picnics, luncheons, promotions and retirements.

Participated in laboratory picnic.

Rather limited due to weather and distance of AFAL from Lancaster.

		A (High) . . . D (Low)			
15.	Technically challenging?	A- 120	B- 45	C- 2	D- 1
	Future research opportunity?	A- 119	B- 37	C- 3	D- 1
	Professional association?	A- 105	B- 47	C- 6	D- 1
	Enhancement of my academic qualifications?	A- 82	B- 63	C- 11	D- 1
	Enhancement of my research qualifications?	A- 103	B- 51	C- 3	D- 1
	Overall value?	A- 117	B- 39	C- 1	D- 1

B. ADMINISTRATIVE ASPECTS

1. How did you first hear about this program?

Collegues	-	63
Advertisement	-	14
Air Force	-	19
Direct Mail	-	62

2. Decisive aspect of application?

NOTE ON THIS QUESTION, APPLICANTS HAD MORE THAN ONE ANSWER

Area of possible future research funding	- 37
Good research opportunity	- 112
Opportunity to work with USAF	- 43
Location	- 13
Financial support	- 11
Chance of publishable result	-
Flexible research schedule	- 2

3. Did the program timetable cause you any problems? Yes - 15
No - 143

4. Program information satisfactory? Yes - 142
No - 16

5. Did you have problems in domestic aspects? Yes - 26
No - 132

If yes, explain:

Very low humidity in Albuquerque caused significant sinus problems.

Housing - hard to find and high priced, but it wasn't the program's fault.

I found good housing hard to obtain. I had essentially no social contact with any of the people at SAM, except at lunch.

Nonexistent social life without family.

It would have been nice to meet the other summer participants. We may have been able to do things together - sightsee, etc.

Some problem in suitable (10 week) apartment contract.

Housing was difficult to locate at reasonable price.

I would have like to have more information on housing, etc. so I could bring my family with me. As it was, I came on my own.

Check cashing, etc., they were suspicious (in local stores, etc.) of my temporary status.

There needs to be someone at the base assigned to find housing. It would be better if base family housing were assigned temporarily.

Base housing would have been desirable.

Housing problems.

I wanted to use the VOQ but could not.

Difficult to find short term lease, family-oriented, furnished housing with basic amenities such as a telephone.

Suitable furnished apartment with short term (3 month) lease very difficult to find (I didn't find one and had to pay for 3 months rent).

Housing - on-campus housing would have enabled me to spend more time in the lab.

Social life was rather pathetic.

Social life - not a lot of single folks there.

My seventeen year old son applied for a part time job with no success.

It is too expensive to rent apartments for the 10 weeks. If accepting institutions could provide housing or obtain special rates for the participants, it would be more feasible for persons having established homes elsewhere.

Living on base without a car and without commisary privileges made it difficult to obtain the basic neccesities of the food.

High rent; landlords wanted more rent for children in apartment.

Boston is a difficult and costly place to find suitable housing.

6. <u>Stipend level?</u>

Generous	-	9
Adequate	-	118
Meager	-	31

<u>NOTE, THAT NOT EVERYONE WENT ON A PRE-PROGRAM VISIT</u>

7. <u>Pre-program visit?</u>

Essential	-	108
Convenient	-	34
Not worth expense	-	4
N/A	-	12

8. <u>Housing information:</u>

VOQ	-	13
Apartment	-	99
Other	-	46

9. <u>Mailing list suggestions?</u>

I think each engineering and basic science department at each school should receive its own information. Don't expect Dean or Research offices to disseminate info.

American Chemical Society

American Psychological Association Monitor

I think that the program could be advertised in ORSA/TIMS and the Institute of Management Sciences.

Univ. of Southern Mississippi Mathematics Dept. Hattiesburg MS 39406-5045.

University department heads.

Dept. of Electrical Engineering Office, University of Lowell, Lowell MA 01854.

Physics Today, AIAA magazine.

Send information to Biology, Chemistry, Math, Physics department chairs. It is more likely to get to interested faculty than if sent to Deans.

Dr. D. C. McHenry, Dept. of Math, Tennessee Tech. University.

Place ad in IEEE Spectrum (seen by 160,000 readers).

University of Lowell; Department of Mathematics, Physics, Engineering, Computer Science.

Include list of participants, projects and home institution if participant had a good experience, he/she would be excellent advocate.

ACM, IEEE.

Dept. of Chemistry, Southern University, Baton Rouge, LA 70813.

Dr. Walter H. Birkby, Anthropology Dept., University of Arizona, Tucson, AZ. (Dr. Birkby is an expert on hair analysis).

Dr. Thomas Armstrong, Dept. of Physics and Astronomy, Kansas University, Lawrence, KS.

Physics and Engineering Depts. (especially Electrical Engineering) at Worcester Polytechnic Institute, Worcester, MA 01609.

University of Missouri-Kansas City, Truman Campus, Independence, MO.

SIAM News.

American Meteorological Society, Boston, MA.

Program advertisements should be sent to Deans of various colleges of engineering, sciences, etc.

Judgment and Decision Making Society.

American Chemical Society - Chemical & Engineering News.

Rod Heisler, Dean, School of Engineering, Walla Walla College, College Place, WA 99324.

Add in general scientific publications.

Mailing information to Department Heads is an effective approach. Here at Texas Tech, it would be appreciated if information were mailed to Clyde Martin, Dept. Chairman, Mathematics Dept.

Wright Patterson Air Force Base newspaper.

OR/MS Today (Management Science).

Chemical and Engineering News.

Physics and Chemistry Dept. of Eastern Illinois University.

Prof. Ed Motell, Dept. of Chemistry and Biochemistry, San Francisco State University, San Francisco, CA 94132.

Ohio Physiological Society.

American College of Sports Medicine.

Dr. Dean Owen, Ohio State University, Dept. of Psychology

10. Addition of Graduate Student Program increased effectiveness of Program?
NOTE NOT EVERY FACULTY MEMBER HAD A GRADUATE STUDENT WORK WITH THEM, THEREFORE THEY DID NOT ANSWER THIS QUESTION.

Yes - 83
No - 14

11. Did a student work with you? Yes - 34
No - 124

Comments:

Productivity was more than doubled.

It was also an excellent learning experience for the student.

I had virtually no contact with my effort focal point and had a slight difficulty getting questions answered.

It would be more difficult for me to participate if I had to leave graduate students at home.

It distracted me from focusing on the research missison of the branch.

Both students helped considerably. One student directly influenced work in final report. Another maintained his own program and kept me informed on weekly basis.

Essential component for future applications.

Working with a medical student provided many opportunities to discuss the medical aspects and implications of our research effort.

There was a foreign student working part-time on the project, but he had to stay in Brookings.

The graduate student is working on a different research problem with my guidance.

I was unable to recruit a student for this year.

The student help was invaluable in the experimental environment associated with the particular project I was on.

My graduate student was a disappointment.

The availability of the graduate student helped to increase my accomplishment of work.

Tremendous help.

Very helpful, particularly with computer requirements.

Had I had such assistance, I am convinced it would have been significantly helpful to our effort.

The student's participation significantly aided me in accomplishing the summer's project, but also got him off to a good start on his research program for his degree.

Effectiveness depends on student. Could be effective and increase research substantially.

Excellent support.

The graduate student involvement was greatly beneficial to me, to the student, as well as to the laboratory.

He used my computer codes, validated them and often debugged them. It was a great help to me.

It allowed both myself and the student to follow separate yet related research paths.

Two went with me. One finished an M.S. thesis based on work done in program; the other in process of doing likewise.

It allowed me to carefully and thoroughly involve her in all of the experiments conducted during the ten week period and monitor her daily progress.

I decided to work in two projects, because I knew I would have help from the graduate student.

Much of the routine assay work that was done was performed by them. In view of limited supplies mentioned above, their contribution was extremely valuable in accomplishing what was done.

It was a real benefit.

The graduate student was very helpful in running computer programs and setting up experiments.

There were many medical students here by themselves, they should have been moved over to help me rather than full time people here.

Both the student and I learned from each other. I think such pairings should be strongly encouraged.

A faculty-student two-man team can work very effectively and can get outputs much more than two individuals alone. I recommend this approach very strongly.

Very essential.

I believe she profited from it greatly - probably more than I did.

By having the student, greater work detail could be undertaken and a greater number of variables attempted.

I worked with a graduate student from another university that was involved with another project, but his experience from last year helped me with my work.

Helped in accomplishing programming.

12. <u>Program administration overall rating?</u>

Excellent	-	99
Good	-	57
Fair	-	1
Poor	-	1

13a. <u>Comments on the strong points of the program:</u>

Familiarity with the current research problems pursued by AFOSR

15 - Work environment was excellent.

This is a great way to give junior faculty a leg up in starting a research program.

It also provides a fantastic opportunity to use equipment that may not be locally available.

Graduate Student Program, RIP Follow-On possibility, chance to work in a research-oriented environment.

This program can expose researchers to areas of work they may not know of. In addition, the on-site approach can allow concentrated effort.

Opportunity to do research and communicate with others in field.

I would recommend this program to anyone.

17 - RIP Program; Technical Challenge; Research Contacts

Encourages interaction between academic institutions and government facilities.

The opportunity for professors in the academic world to work with Air Force researchers towards a common goal of solving problems.

8 Administration of program and choice of work assignment.

Scope of possibilities for work; making vital relationships between academics and military.

Opportunity to immerse oneself in an interesting area of research.

Good opportunities for career enhancement through contacts.

Opportunity for scholarly research in new surrounding.

Ability to make personal contacts. The library resources are excellent.

Opportunity to do things I could not do otherwise.

The participation of graduate or medical students provides unbiased and energetic mental and physical assistance to the research effort. Another strong point is the opportunity to become acquainted with Air Force research personnel and the research subjects of interest to the Air Force in a certain area.

To have a chance to know Air Force research program. Make good contacts, etc.

Challenge to new applications of statistical methodology to actual data.

Excellent interactions with a diverse group of scientists, outstanding equipment, freedom to carry out research in your own way.

Diverse research locations. Freedom to tailor own research topic, simple application forms, opportunity for follow-on, good library services, away-from-home living expenses.

I was able to get my feet on the ground - participate in solving problems that were of real concern to analysts.

A primary strength the research component of DEOMI is its leadership that provides professional support in effective research development.

5 - Well organized.

Being able to pursue research (with funding) during a time period that is convenient to university faculty members.

Opportunity for basic research and the opportunity to learn about working with the Air Force.

Contact with outstanding professionals on a challenging topic or common interest.

Variety of projects available. Seed money (mini-grant) for new (continuing projects).

Getting to know the research personnel and research programs at USAF laboratories.

Reasonable stipend level, challenging research projects, and opportunity to interact with non-academic scientists.

Opportunity to make contacts with personnel at the AFLMC.

Opportunity to see the problems faced by Air Force personnel.

Pre-program visit. Clear, unambiguous instruction package.

I believe that the program is excellent for academic and professional enrichment. It also encourages research activities at the participants home institutions.

Chance to work with state-of-the-art equipment and personnel who were on the cutting edge of the project.

The very fact that it offers opportunity for faculty to work with Air Force.

It served its purpose as far as the goals I had in mind for it.

The technical support made available to me. There was a general "can do" attitude among staff, contractors, and summer personnel. The opportunity to analyze data from an "in progress" study.

Good research projects are available and many of the Air Force labs offer opportunities to work with competent colleagues.

To be able to work on problems of interest to the Air Force.

Opportunity to initiate a research activity; enhance civilian-military relationship; guidance of most capable fellow scientist.

Elaborated program in regard to location, research and pay. One strong point is early decision in regard to award.

It was such a pleasure to be able to devote full time to research. I found that the AFOSR research brochure was not as effective in describing Air Force interests as was actually doing the work.

The effective exchange of research information from diversified sources.

Provided opportunity to learn of research environment and needs of the USAF. Association with leading edge technology sciences and technology working in the area.

Exposure to research areas, meeting of colleagues.

Good research involvement, facilities, introduction to government programs.

Ability to learn new techniques, collaborate with new people and generate new ideas.

Technical challenge, professional interaction, working with a team, machine shop and technical staff support.

Opportunity to participate in active research, use facilities, make contacts.

Chance to make valuable contacts, see what areas are of interest to AF and are potential continuing research areas.

Provides opportunity for developing research project(s), collaborating in common research areas, knowing more scientists and to learn more about them. Defining research goals and interests.

Contact with AF colleagues.

Opportunity for re-juvination of research interest; establishment of new professional association with USAF researchers.

Contact with AF personnel who can relate best with academic research; ease of administrative burden; future continuation established as part of program.

Provides introduction to AF projects and personnel which would not be available otherwise.

Opportunity afford to us. Flexibility in timing of the 10 week period.

The major strength of this program is the simple manner in which college faculty are introduced to AF research programs and personnel. No other program, I believe, allows one such important access to ongoing research governmental research in such a simplified and untangled manner.

Opportunity to be in strong research environment, contact with broad spectrum of scientists at base, keeps me up on developments in instrumentation and research.

Opportunity for substantial interactions with Air Force personnel in a research area and to gain an insight into the direction or thrust of a laboratory's research. The short term length of the program is sufficient to do this.

Interaction with lab personnel and forming contacts with whom I can call for conferencing on problems; ability to begin new research interests.

Keeping in touch with real world of research. Good academic value.

An opportunity to work with Air Force personnel on a useful research project that may save the Air Force time, effort and money.

Interaction between Air Force and academics very valuable.

Opportunity to interact with other scientists, to learn of Air Force research interests.

Opportunity to learn inner working of various labs.

Enables one to develop contacts with researchers in their area who are generally engaged in problems of a very timely nature.

Gives an opportunity to an individual researcher to interact with currently involved researchers.

Excellent opportunity for basic research; opportunity to interact with US government; adequate compensation; excellent opportunity to establish future professional contacts.

Provides government/university contacts; creates new research directions.

Giving an ivory-tower professor the chance to learn about real Air Force problems.

Quality of laboratory equipment and technical interaction was excellent. The experience was rewarding and satisfying. The program is well-administered.

Bringing together faculty members and government laboratory research personnel to a common focal point in developing future research directions.

Opportunity to interface with base personnel.

Opportunities to meet with AF Scientific and Engineering personnel; to diversify research opportunities and to work in areas not routinely available to faculty personnel.

This offers faculty from small colleges the opportunity to work with state-of-the-art instrumentation.

Provides opportunity to senior faculty to explore programs for outside their bread-and-butter area of expertise.

This program is very helpful especially to those who hardly get much time to do research during the regular academic year. They look for the summer when they could do some studies of their own. This program brings researchers in universities closer to the researchers at the Air Force. This is good for the nation.

Fostering university/Air Force lab collaboration and familiarization. Provide hands-on experience to graduate students and academic faculty on Air Force research needs and resources.

Research programs available, research institutions, pre program visitation, final report obligation, administration involved in coordinating the program (UES).

Technical aspects, working in two projects, I was exposed to two fields of Aerospace Engineering.

State-of-the-art research facilities that are otherwise inaccessible at my university were freely available to me during the course of the summer program. I have hopes that this experience may lead to further collaborative association between AFGL-LID and my research group.

It gives excellent opportunity for interchange between universities and government.

Good opportunity to get involved if the research interacts parallel and the pre-summer coordination is efficient.

An excellent opportunity for faculty to get away and concentrate on a research topic. Exchange of ideas between lab personnel and faculty is very productive.

Mutual future research opportunities for faculty and Air Force.

The provision of the opportunity to engage in meaningful resources without the distractions of faculty, committee assignments, etc.

Onsight experience at watching Air Force problem solving.

Spending 10 weeks on (or near) an Air Force base.

Helpful in making professional contacts.

It gives a different prospective.

The definite research proposals are not required upon entering and that "retooling" of faculty out of research for a period is an objective.

Research opportunities are excellent. The individuals with whom I interacted were to a person eager to work with me and share their expertise. The strong points of the program were the technical staff and their attitudes toward working with summer faculty participants.

Almost generous stipend, possibility of Research Initiation Program funding future research, research facilities of host, 10 week duration, pre-summer visit, scheduling flexibility.

Access to personnel and facilities. Opportunity to work on important, timely, technical problems. Contacts within USAF which can aid in funding solicitation.

Good research involvement, facilities, introduction to government problems.

The promise of research facilities that many small universities can not provide.

Gives academics a look at Air Force research facilities - and research interacts.

The opportunity to interact with professionals who work in an applied setting, and the hardware and library facilities. Another strong point is the opportunity to focus on a research problem for 10 weeks.

The program allows invidivuals in academia to get a quick taste of the methods and types of research currently of interest to the Air Force. This would be difficult without this program.

Good opportunity to break into a research area, if the USAF can offer an opportunity, as it did in my case, where the research possibilities fit my research interest.

Work with a research colleague who is knowledgeable in my technical area; understands the Air Forces needs; can help me get started in a research direction which is profitable to Air Force and myself.

Sufficient information on responsibilities and clearly stated deadlines.

The opportunity to get first hand knowledge of the technical problems important to the military was enlightening. Direct contact with personnel making funding decisions was also beneficial.

For my participation and research the whole program was very well organized. For my specific area, I can suggest no improvements or cite any weak points.

It opens the door to the researcher that is willing to "hunt" for projects.

Two strong points of the program are (a) access to non-university research subjects and (b) collaboration with non-university scientists.

Exposure and involvement in on-going research activities at the laboratory.

The opportunity for professors and small non-research institutions to maintain a modest research program, interact professionally with colleagues in a research setting, and remain abreast of research developments.

13b. <u>Comments on the weak points of the program:</u>

Support should be increased

Holiday pay should be included.

It should not be dependent on the presence of any one individual. My experience was significantly negatively affected by just such a thing.

I really can't think of anything that I have been unhappy with.

17 - The duration may be too short.

None, really. But the instructions seem to say the budget must be submitted along with the acceptance letter, yet some of the information requested on the budget form (e.g. exact area of research) will probably not be known until after the pre-summer visit.

Billing and payment procedure. I'd like to see two equal monthly checks provided covering 8 weeks of effort. Pay the final 2 weeks check on receipt of approved final report. Travel checks should be paid on receipt of travel bill. The existing paperwork may be good training for USAF bureaucracy, but it seems unnecessary to me.

Better communication between UES and the AF lab, and better communication to applicants regarding the mission of various labs.

21 - Low salary.

The timing of the program is a problem that we all acknowledge.

Possible mismatch of area of expertise with area of assignment.

I can't seem to get AFOSR interested in long-term research support.

Administration on UES end.

I encountered none, except for cash flow at start-up. Twist AFOSR's arm, get some money for start-up transferred to host institution or something. Advances??

Little chance of continued summer appointment (subsequent years).

Lack of contact with others in the AFRP at AFWL. The lack of information about AFWL.

Unless experiments are "ready to go" when we arrive - we can never finish them.

Remuneration: some kind of advance would have been less perturbing to my budget. Also, reporting to the IRS of per diem payments is irritating.

Difficult to find a nice, succinct 10 week topic other than review studies and such. Especially difficult to organize a laboratory study unless all of the equipment is available.

If specific chemicals or supplies are required for a project, they cannot be ordered because it takes more weeks to process the paperwork than the 10 week program lasts.

Too much paper.

The greatest weakness in the program was the difficulty and delay in obtaining small supplies and chemicals for research in a reasonable period of time.

Advertising - I'd seen your information booklet (red booklet) before but was not sold on the program.

Need more information (early) on living conditions at the research locations. Also, help in locating living accomodations would be appreciated.

It was late in the schedule when I was finally called. A second call came to also invite me, but it was a week too late.

Interaction with UES program administrators (are they too busy?)

Limited equipment and chemicals (at research site) and limited funding for travel during summer research period.

Difficult to meet and get acquainted with all the people you need to know in 10 weeks.

More projects need to be identified that will allow a summer researcher to carry out experimental work.

From conversations overheard - need better planning for housing, consideration of graduate students means of transportation.

No effort was made to have the participant interact with anyone other than his/her designated colleague. There should be more organized effort to meet with other individuals and groups with interests similar to particpant's. An Air Force officer said he would meet with all participants; no such meeting was held with me.

The late notification of my appointment which meant that I couldn't make plans or arrange to have a graduate student. The lack of opportunity to design research from the ground up and execute it within the 10-week period.

Poor housing support available. Secretarial support should be guaranteed as a condition for participation by a laboratory in the program. The AFWL was not ready to provide the secretarial support needed to keep up with our research results.

Being away from family and students.

Timing.

I was not informed if I could bring a graduate student along. I thought it was optional.

A pay check from UES spent two or three days in the Dayton post office. Needless to say, that caused me some anxious moments.

People in program tend to be from same region of country, difficulty in getting broader base of participants - I don't know how to correct this.

Military protocols may sometimes seem strange to civilians and sometimes cuts into research activities.

Host institution might better prepare stable place for work; difficulty and time delay for procuring necessary equipment; USAF researcher should be freed of administrative duties; misdirection of paychecks; weak (no) communication between technical focal point and UES area representative to coordinate beginning of program.

Lack of communication of the administrative aspects of the program to Air Force personnel. Lack of flexibility in possibly allowing more than 10 weeks for the research effort.

There is a definite lack of mechanism for purchasing often needed S&E. In addition, it may be helpful for the various and specific laboratory heads to become more aware of whom they have at their disposal for the summer. There is not nearly enough to give and take between SFRP fellows and decision makers.

On the other hand I would have liked to have been more technically involved with some of the work the full-time engineers were conducting.

Short time of work period combined with slow procurement process of Air Force often causes problems in getting supplies to adequately conduct research.

Needs a better description of research interest of individual labs in original information.

Short term nature of the program makes it difficult to accomplish much, especially in an experimental area. Nevertheless, the prospect of a continuation grant encourages one to get started immediately and begin something worthwhile.

Need automatic follow-on appointment. One year is not enough time.

Communication of existance of the program and coordination of Air Force requirements with intern early in the time period.

I really have none to list. I believe this would be a function of your colleagues at the lab. I was fortunate to be associated witih a good group.

More interaction with other Summer Faculty Program participants; arrangements for tax deductions by UES; more opportunity for interaction with effort focal point.

10 weeks is 2 weeks too long. Eight weeks would be long enough to accomplish the same tasks and reduce the time away from home and family and change the lease from 3 to 2 months.

The program is well run, but less paper work will be quite helpful. For example, biweekly reports could be avoided.

Lack of funds for the specific project.

Freedom in work direction leads to first few weeks being lost to orientation.

Housing availability at the point of research; stipends for senior level faculty members.

Social activities are reduced.

The ten weeks maximum is too inflexible. Fourteen would be better. The $20,000 amount of the mini-grant needs to be raised to $25,000 to $30,000 to allow enough money to support a student, with the possibility of renewal for a second year.

Younger faculty may need a little more support in writing a follow-on research proposal.

Mini-grant could be increased to $30,000.

No means of knowing what other fellows are doing.

Need for expendable supplies budget and purchasing mechanism.

Time and resources necessary to develop computer software a little pressed.

At AFHRL, one of the individuals in the lab seemed to think that those of us there for the program were there to be his research assistants. I was not able to even start the research I'd planned until 8 of the 10 weeks had passed. This was due to limited personnel available for software development being placed on other tasks time and again. It was clear that this individual felt that the research I had come to do was of little importance or interest.

Should have some SFRP travel funds available in case a project requires travel.

Perhaps the overall program is strongly "tilted" toward Physical Sciences.

10 weeks may be too short for some participants - A 1,2,3 week extension option might be considered - the summer participant could request such an extension with his research colleague's approval near the end of the 9th or 10th week - would allow summer participant to wrap things up, write report, etc.

Determining who was my local effort focal point.

It would be more productive if the technical focal point could be given time to participate more directly in the research with the program participants.

Hard for faculty to adjust to 8-5 regime.

Being isolated from home/work causing a backlog of duties.

I found the information on final report weak. The example was completely out of the engineering field and included no figures for comparison. Should also allow more than 20 pages or not count the title, abstract, acknowledgements in the final count.

No way to efficiently acquaint potential research contacts with your own interests and how those offices might benefit from your research.

There was no interaction with other participants until the latter part of July.

14. Has this been a fruitful, worthwhile, constructive experience?

Yes - 156
No - 2

15. Other Remarks.

It is a good program and should be continued.

This is a fantastic program. Need to establish minimum standards of support so that people aren't left in the cold, as I was, by someone's change in plans.

I feel that my 10 weeks at RADC have been very helpful to me. I have had a chance to interact with several different people in different areas, and feel that I have made important contacts. I have been able to supervise graduate students working on a continuing research topic while I was free to develop a new, more fundamentally AI research topic. The people, equipment, and general environment have all been positive.

As a mathematician, the contact with engineers has revealed many applied problems which should be considered. I felt that this has been a very enriching experience.

This was an outatanding experience for me and my two graduate student participants.

I like to thank the Lab. and in particular my research Colleagues for a very fruitful and enjoyable summer. I also would like to thank the administrative staff of this program from the UES Company for being so helpful and cooperative.

The Air Force and Civilian personnel at AFESC are great to work with. They make SFRP a fine experience.

It was a good learning experience. I was provided a truly enjoyable working atmosphere.

It would be helpful if there was some sort of written statement available that would comment (advise) on the tax liability (in less that complete legal jargon) of the stipend.

Excellent program - both UES/AFOSR and ESMC/DVEP.

AFWL should have "greeted" us as a group after most of us had arrived. They should have given us a presentation about the work being done in the Lab and shown us how our work fit in. Some social activities would have been nice. Please feel free to contact me, if you have questions and/or need clarification on any of my comments. In summary, I had a very positive experience this summer at AFWL. Being given the opportunity to immerse my energies into investigating parallel processing was wonderful. I believe I've gotten a reasonable foundation on which to build and proceed onto more advanced areas in the field. My experience would probably have been enhanced if a parallel processor had been available at AFWL and a resource person(s), i.e. someone with some (more than one class) experience with parallel processors, was on site. (See comments throughout this questionnaire). My initial learning how to use a parallel processor would probably have been shortened and I could have proceeded to more advanced areas. The opportunity to explore NM on the weekends was absolutely wonderful. Thanks. - P.S. Dump the frank and beans for the get-together - how about burgers, even? Also, can we include our technical contacts in the social get together? This would be most helpful! (NASA Case Western Program does this).

A very well desired, well conducted program. Also, AFHRL personnel are especially helpful.

I had to severely edit my report to get down to 20 pages.

The summer was enjoyable. I came across a new application and learned about the application of statistical methodology to real data. The summer was very fruitful from technical point.

I would like to thank UES officials and AFOSR officials for the opportunity of participating in the Summer Faculty Research Program. The program has been of great benefit to me. It has (1) given me the chance to meet Air Force scientists and learn of their role in understanding and improving health conditions of Air Force personnel, (2) familiarized me with some of the research interests of the Air Force so that I may propose a research project that has a chance of being supported.

It might be highly desirable to allocate a $500-1,000 chemicals/apparatus/supplies budget to each UES fellow to facilitate rapid acquisition of small but crucial items required for the completion of the project.

Thank you for taking me aboard this summer. Hopefully, the seeds I've planted will begin to grow and bear fruit in 1988.

My experience was very good. Negative comments that appear should be considered minor.

The researcher could not have chosen a better program to do research. The effectivenss in identifying and implementing research concerns by its leadership and staff is remarkable. The professional, yet very warm association will be remembered for a long time.

A terrible misunderstanding took place which left me in a very awkward and embarrassing situation. I was under the impression that it was most important to complete my objectives to the best of my abilities. Therefore, I chose to use the best resources I had available to me. I did tell my focal point I would be using the computer system at Wright State University; however, being very independent I did not keep as close of contact as was expected of me. This resulted in a confrontation in regards to the amount of time I spent on the job. This was very embarrassing and frustrating for both myself and my family, since I spent many additional hours at home working on this project, neglecting my family. Furthermore, a letter was sent to you and to other lab officials stating my requirement was to remain in the lab during the work day. I would not have had reservations, but since the lab did not have adequate facilities to access the Wright State computer remotely, I was forced to spend hours outside the work day finishing the computer work of my project. Luckily, most of the work was completed before this incident occurred. When the lab read the results of my work, they were very pleased and impressed by them. However, because of the incident I am not so sure my credibility isn't questioned. That is my worst fear. I am a young scientist hoping to have a rewarding career in research, and it would be detrimental to let an incident like this to tarnish my record. I have come to realize that my lack of communication may have caused this situation, so I have learned from this. However, I will always maintain my principle of committing the best work according to all the resources I have available.

I highly recommend the program to all interested faculty members.

This is an outstanding opportunity and I will try to plan a similar venture again. We faculty need to encourage graduate students (citizens) to take advantage of the program to focus on thesis or dissertation topics.

Projects were very dependent on foresight of focal point. Because of ordering delays it would have been very useful if a means were available for expediting purchase of reagents and other low cost items. With demands placed on teaching faculty it is difficult to stay current in one's own discipline let alone gain experience in another. This summer has been a rare opportunity for the latter. Given the time and resources I can still do some good science, and that is important for me. Thank you for the opportunity.

I enjoyed the work I did very much, and I hope to be able to continue the research I started during the summer.

This program is very valuable to both the research site and the participant and should be kept going.

It would be nice if there were a "standard" machine readable format where these reports could be provided on a diskette and a rough copy. You could then merge more easily and produce a "searchable data base" instead of only the volumes.

This was a great summer. I hated to leave. I look forward to working with the Air Force staff in Mortuary Affairs in the future.

[illegible] and enjoyable program.

[illegible], the program has been very good. It has reinforced my knowledge base and has allowed me the opportunity to clarify and better understand principles and concepts studied in graduate school. I think that if more experimental projects could be added, the program would be [illegible] more.

[illegible] finding information on the program. [illegible] had apparently taken me off the mailing list. I found [illegible] only one day before the [illegible]

[illegible] Perhaps the most important [illegible]

[illegible] the program [illegible] my [illegible] at the University.

[illegible] program [illegible]

[illegible] should be given to [illegible] the [illegible] the

It would be helpful if there was more preparatory time, especially where airlines are changing schedules and rates rapidly.

Due to military procurement policies, obtaining necessary materials have proved to be difficult. Some supplies ordered during the pre-summer visit were not available until the 7th week of the summer. Had I not purchased these supplies myself, my research would have been delayed that long. I do want to emphasize that this was not caused by anyone in my support unit, it was caused by USAF policies. All members of my support team deserve applause and commendation for their efforts.

I truly enjoyed the summer research opportunity. It was extremely beneficial in terms of research output. The final report is a very good piece of work on a current problem and I will be publishing it in a professional journal. I wish to continue in the summer of 1988 if at all possible.

1) The arrangement with 5th/3rd travel to bill tickets directly to UES was not convenient - thank you, 2) A booklet or seminar on the tax consequences of the summer research would be helpful.

The work and experience was stimulating and mutually beneficial. Plan to continue this work by applying for the follow-up RIP program. Research proposal is in preparation. Thanks are expressed for support of USAF and UES Inc.

It would help if the laboratory had a design/drafting staff to expedite the design drawings of new hardware.

I enjoyed the work and atmosphere.

An excellent program, provides worthwhile experience.

I enjoyed the experience. I would like to see the program expanded so that individuals might be able to participate over several summers in succession at perhaps either the same or several AF institutions. I would like to see the program expanded to more than 10 weeks for some individuals who want it.

I was dissatisfied with the mail distribution system at the laboratory, and I do not consider this a trival matter. Two manuscripts sent to me for review while I was there were returned to the sender, despite the fact that the distribution center was notified of my presence on base. If this program is to be available to established investigators with academic lives that cannot be halted entirely for a summer at an AF installation, I believe that this support units should make every effort to facilitate the maintenance of the visiting faculty's life outside of the wire fence.

I have enjoyed this program very much. I have accomplished a lot of work and learned a lot from the research group.

The group I worked with had high hardware design expectations and viewed the program more as a source of free labor than of an introduction to future possibilities.

The format for the final report is fairly useless. It would be more constructive to request a report in the usual format of a scientific paper or technical report and have a separate document (possibly part of this questionnaire) describing the interaction of the participant and the research lab. With so little time it sure would be nice to have prepared a document for publication rather than the final report with its unique format useful (maybe) onto to UES.

Thank you for this opportunity.

I believe that a housing (or daily expense allowance) should be granted to those living within 50 miles of the work site. This could be less than the allowance for those from farther away but local people have food and car expenses just as those from non-local workers.

Good summer experience!

This has certainly been a worthwhile experience and I would recommend it highly to a young colleague.

Thanks for the opportunity to participate in this program - it was very enjoyable and worthwhile.

Very good program - very well run. Should advertise more.

Excellent program.

Increased stipend level to at least 1/3 of nine month salary paid to starting assistant professors in research institutions. The present salary level can attract only people from community college, etc.

I enjoyed the experience and was very satisfied with the outcome of my stay at the lab. I intend to stay in contact and continue to examine the sort of problems introduced to me.

This program helped me keep active in research.

I wish to thank everyone for making my summer visit both enjoyable and profitable.

Overall an excellent and positive experience.

The program is outstanding. It opened my eyes to a whole new area of research. The major difficulty for me was being too far from home to drive home weekends. I hope that in a few years I can find a program similar to this so I can once again find a new "real-world" area of research.

This was the most satisfying summer program I had.

The research colleague in the laboratory was very helpful and always available for technical discussions. He was knowledgeable in formulating the direction of the research project. The coordinators of the Summer Faculty Program at UES were very pleasant in dealing with the participants. Their enthusiasm in meeting the administrative responsibilities were commendable.

A second visit should be a must as opposed to the policy or discouraging a second visit the next year.

This program has given me an opportunity to look into an area which was not within the area of my awareness - although I not only had some preparation for working in the area but even a great need for. Just the fact that my students are more aware of the Air Force research needs in the upper atmosphere because my interactions has been of great value. I hope that my findings and future research will help the Air Force.

Please keep this program alive! I am especially grateful to UES for their help. They smilingly helped me everytime I needed any help from them. They are very smart and friendly. I am sure that they are contributing a lot for the success of the projects of UES. I have the best wishes and the best regards for them.

UES staff has been at all times helpful, reliable and flexible. It has been a pleasure to intereact with UES.

I look forward to continued participation in future UES programs. It has been a wonderful opportunity and privilege.

I am very happy to have initiated a relation with the USA Air Force. I will direct my research efforts toward the Aerospace Engineering.

As a way of maintaining communication, the possibility of a five week stay in the same laboratory next summer would be desirable, especially if a student is also along (for the 10 week program). Especially for the second year at an institution, 5 weeks would be optimum.

If I am able to complete the research, I shall have made a great leap forward. The whole summer experience left me very enthusiastic.

I think this is an excellent program and I hope that the Air Force continues to support it. The experience was very rewarding to me personally. I came away with enough new research ideas to keep me busy for several years.

Thanks to UES for taking care of administrative matters in a professional way. It was a great help.

Program should be expanded so that every faculty participant could have graduate student research assistance if possible.

I enjoyed the experience very much and hope to maintain some affiliation with the Air Force research community.

I think the stipend should be substantially increased. In my case I had to have a supplemental salary from other research accounts.

My project required extensive instrumentation. Several key components were unavailable at the base, and I had to borrow them from my home institution or modify my plan. Governmental "red tape" made it impossible to purchase the items within the 10 week research period. A small stipend ($1-3K) for equipment would be helpful. The equipment could then be used for the mini-grant and eventually revert back to the government.

The stipend is meager at best. I suggest you consider increasing the stipend and adding 2 weeks pay for the final report rather than holding up two weeks pay.

This program has been very beneficial to me. Thank you very much. I hope I will be able to pay the Air Force back through my future research.

The cutting edge of research could very well be my technical focal point. If given half a chance he has ideas and capabilities far ahead of his day. Another military contact I worked with is one of the best NCO's I've met in 21 years of military service. He needs to be strongly encouraged to stay and lead other NCO's.

This was an outstanding experience for me and my two graduate student participants.

I consider this experience to be superior for me.

Overall I believe this is an excellent research opportunity and is well administered.

Upset by my apartment managers who kept $60.00 of my $200.00 deposit. That's $30.00 a month and I believe it was totally unjustified. I left the apartment cleaner than it was when I moved in.

I have enjoyed, and hope to benefit for some time to come from, this activity. The people involve in the program were supportive and added to the experience. UES has made what could be a very difficult task function smoothly and is very cooperative of the researchers requests.

Because I already knew the lab, people, project and the desired goals of the project, I probably had an absolute minimum of problems and frustrations. Thus I can be most complimentary to the program.

I enjoyed my experience and was glad that UES took over the details so that I could concentrate on my work. Thank you.

I came "on board" in mid-May - I spent 4 weeks wandering around before I was able to identify a problem that might have the potential for future research. The program should make it possible for the "early birds" to make "preliminary" presentations to larger groups of prospective technical clients.

The amount of follow-up grant is small. The faculty member has to buy time for research and he also needs support for several visits to the laboratory during the year of the grant; due to the nature of some research peculiar to certain laboratories, the subsequent support for continued research after the expiry of the mini-grant should be discussed and defined for the benefit of the visiting faculty. Because of the laboratory interest in some research area, an off-site research contract with the laboratory could be mutually beneficial.

I would like to see the housing information out with the letter of appointment. Would it be possible to have a meeting of all participants earlier in the summer?

It has been a worthwhile experience and look forward to continuing relationship with AFAL and participation in their research program. It has definitely broadened my sphere of research with benefits to my students and university in the long run.

Many fellows felt that the center itself was a very friendly, helpful place. However, the base personnel were too much concerned about status, rank, etc.

1451s

APPENDIX 1.C

LABORATORY REPRESENTATIVE'S QUESTIONNAIRE & REPLY SUMMARY

1987 USAF/UES SUMMER FACULTY RESEARCH PROGRAM

EVALUATION QUESTIONNAIRE

(TO BE COMPLETED BY LABORATORY REPRESENTATIVE)

Laboratory/Center ____

Name ____

1. How do you rate the correspondence, verbal and telephone communication, and other aspects concerning program administration?

Excellent____ Good____ Average____ Poor____ How could it be improved?

____

____

2. The participant selection process is two-fold: academic and technical. Did you have sufficient time to conduct an evaluation of applications?

YES____ NO____

Comments: ____

____

____

3. Was the number of faculty researchers assigned to your organization satisfactory?

YES____NO____. If not, how many would be desired?______________ How do you determine this number?

____

____

4. Please rate the expense-paid pre-program visit:

Essential____ Convenient____ Not worth the expense____

5. In your opinion is the ten-week time period an optimum length of time to develop a viable working relationship among the faculty researchers, students, laboratory/center personnel and programs? YES____ NO____. If no, what length would it be.

____

____

Other comments:

____

____

____

____

6. Did your laboratory/center establish a seminar program, or other means, to "tap" the faculty associate's academic knowledge other than his research assignment? YES____NO____.

If yes, give description and evaluation.

____

____

____

LABORATORY REPRESENTATIVE QUESTIONNAIRE (Page 3 of 5)

7. Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate assigned to your organization?

YES____ NO____.

8. Did you have a formal exit exercise for each associate such as a final technical briefing presented to the organization management, a private interview, or other?

YES____ NO____.

9. In your opinion, what was the overall quality of this year's participants as measured by attitude, technical competence, work habits, production and meaningful research accomplishment?

(Note: These answers will be held confidential.)

List Names	Superior	Excellent	Average	Poor

10. Do you believe the Graduate Student Program enhances the Summer Research Program?

YES____ NO____

11. Was a student assigned under the Graduate Student Summer Support Program to your laboratory this summer? YES____ NO_____. If so, was their participation productive? YES____ NO____.

12. Please furnish any recommendations you may have on improving the Graduate Student segment of the program.

____

____

____

____

____

13. Site visits were made by Program Director and/or Administrator and the AFOSR representative. Do you feel these visits are beneficial to the program participants and Laboratory in understanding the management of the program? YES____ NO_____. Do you feel these visits should be done again next year. YES____ NO____.

14. UES has a coordinator assigned at your base to assist the Summer Faculty participants in the administration of the program. Did you find this beneficial to the program. YES____ NO____. Are there any problem areas coordinators should administrator in future years?

____

____

____

15. Please furnish any other comments or suggestion to improve the program in future years.

THANK YOU

1987 USAF/UES SUMMER FACULTY RESEARCH PROGRAM
EVALUATION QUESTIONNAIRE
LABORATORY REPRESENTATIVE

[illegible] you rate the correspondence, verbal and telephone [illegible]ation, and other aspects concerning program administration?

[illegible]	8
[illegible]	13
[illegible]	2

[illegible] be improved?

[illegible] and "can do" attitude at UES are outstanding.

[illegible] understand that if a Summer Faculty person wnated [illegible] was automatic; had many unexpected people - some [illegible] Except for last minu[illegible] cooperation by UES about [illegible] for ones "forced" on us by S.F. choice.

[illegible] No status received after recommendations are [illegible] information on projected start dates, not [illegible] given to the accepted applicants which [illegible] gave the program manager responsible [illegible]ation.

[illegible] frequent communication regarding plans, [illegible] in the program

[illegible] evaluation of

More time would have been valuable to allow us to call and interview applicants.

3. Was the number of faculty researchers assigned to your organization satisfactory?
   Yes - 17
   No - 6

If no, how many would be desired?

2 or 3.

10.

14.

13. Interest in the SFRP within the laboratory.

7.

4. Please rate the expense paid pre program visit
   Essential - 18
   Convenient - 4
   Not worth the expense - 1

5. In your opinion is the ten week time period an optimum length of time to develop a viable working relationship among the faculty researchers, students, laboratory/center personnel and program
   Yes - 17
   No - 5
   N/A 1

Other comments

Consideration of all [illegible] is a good choice.

Ten weeks is probably [illegible] laboratory perspective, [illegible] period [illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

A number of the faculty gave lectures in their area of expertise. These were outstanding contributions.

Seminars were very well received by laboratory personnel.

The professors generally wanted to spend their time working, not preparing seminars. They did attend our technical presentations and most, if not all, gave a final seminar.

Did the laboratory/center conduct a general briefing, tour, and/or other formal means of welcome and introduction for the associate assigned to your organization?

Yes 8

No [illegible]

Do you have a formal exit exercise for each associate such as a final technical briefing presented to the organization management, a private interview, or other?

Yes [illegible]

No [illegible]

In your opinion, what was the overall quality of this year's participants as measured by attitude, technical competence, work habits, productivity and meaningful research accomplishment?

Name	Superior	Excellent	Average	Poor
	46	[illegible]	[illegible]	

[illegible]

Yes

No

No

[illegible]

Yes

No

No

[illegible]

No

12. Please furnish any recommendations you may have on improving the Graduate Student segment of the program.

It worked quite well for us.

Seems to move along nicely and produce results. If the program did not help, we would heart about the fact from our personnel.

Will not accept graduate student unless they are assigned to work under the guidance os a SFRP participant.

Can't immediately visualize mechanics, but someway of knowing if you select Dr. X you'll also get Mr. A and B for planning purposes only - like physical space. As it was, had two separate exercises with the GSSSP people being dictated in the end by SF selections.

Graduate students should be required to have had a few graduate courses to improve quality, however, in general the students are very good and some method of keeping them under a co op or other type program should be found.

We could use a few more students. We had three this year, but could easily have used six or seven.

It [illegible] great [illegible] add Research Initiation Grant opportunity for graduate student who come on their own.

Increased emphasis on advertising of the program to increase [illegible]

M[illegible] between graduate student and faculty.

[illegible]

[illegible]

[illegible]

[illegible]

13. Site visits were made by Program Director and/or Administrator and the AFOSR representative. Do you feel these visits are beneficial to the program participants and laboratory in understanding the management of the program?

Yes - 14
No - 5
N/A - 4

Do you feel these visits should be done again next year?

Yes - 15
No 6

14. UES has a coordinator assigned at your base to assist the Summer Faculty participants in the administration of the program. Did you find this beneficial to the program?

Yes 12
No 2
N/A 9

Are there any problem areas coordinators should [illegible] in future years?

Civilian personnel has a "newcomers" package which [illegible] to each of the participants prior to their arrival [illegible]

Dan Danishek does an excellent job. [illegible] the programs without him.

Only talked with him on two [illegible]

[illegible] program in future years

[illegible]

[illegible] budget [illegible] request for the year to [illegible] improving program management [illegible] the projected data for research [illegible]

[illegible]

APPENDIX D

PARTICIPANT RESEARCH OF LEAGUE QUESTIONNAIRE & REPLY SUMMARY

1987 USAF/UES SUMMER FACULTY PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT'S RESEARCH COLLEAGUE)

Name ______________________________ Title ____________________

Division/Group ______________________ Laboratory ________________

Name of
Participant ____

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site? YES ____ NO ____. If yes, where/how/what?

2. Was the Faculty Associate prepared for his project? YES ____ NO ____

3. Please comment on his preparedness, competency, scope, depth of knowledge of subject area

4. [illegible]

5. [illegible]

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory? YES___NO___.
   If yes, how?____

   ____

7. Would you classify the summer effort under the SFRP as research?
   YES___ NO____.

   Comment: ____

8. Was a Graduate Student assigned to your group this summer?
   YES ___ NO ___. If so, did this enhance the research productivity?
   YES ___ NO ___. Was it an administrative burden? YES ___ NO ___.

9. Were your relations with the Associate satisfactory from a technical point of view? YES ___ NO ___. Suggestions as to how they might be improved.

10. Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence? YES ___ NO ___ Comment.

Do you feel that introduction to each other, together with the summer work experience and performance, could form a sound basis for continuation of effort by Associate at his home institution?
YES ___ NO ___. If yes, how?

If not, why not?

COLLEAGUE QUESTIONAIRE (Page 3 of 4)

12. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective do you think this program will be in that respect? (high) A B C D (low)

13. Also, please evaluate: A (high........D (low)

Opportunity to stimulate group activity	A	B	C	D
Professional association	A	B	C	D
Program administration	A	B	C	D

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program?

2. Were you involved in the screening and prioritizing of the faculty applicants for your lab? YES___ NO ___. If yes, do you have any suggestions for improvement of the procedures used?___________________

____

3. How do you rate the importance of the expense paid pre program visit to the work site? Not worth expense __ Convenient __ Essential __. Please add any comments: ______________________________________

4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish more than ___, less than ___, about what you expected ___? Comments:

5. [illegible] another [illegible] to be [illegible] to you [illegible] NO [illegible]

6. [illegible]

COLLEAGUE QUESTIONAIRE (Page 4 of 4)

7. Should the Graduate Students only be assigned to research with the Summer Research Faculty Member? YES___ NO___.

8. Should Graduate Students continue to be assigned without Summer Research Faculty supervision? YES___ NO___.

9. Other remarks: ______________________________

____

____

1452s

1987 USAF/UES SUMMER FACULTY PROGRAM
EVALUATION QUESTIONNAIRE
(TO BE COMPLETED BY PARTICIPANT'S RESEARCH COLLEAGUE)

A. TECHNICAL ASPECTS

1. Did you have personal knowledge of the Associate's capabilities prior to arrival at work site?

YES - 92
NO - 63

If yes, where/how/what?

He had performed research for AFATL while at Mississippi State University.

His biographical sketch which outlined his prior research and publications.

14 - He has worked here previously on the Summer Faculty Program.

He performed a 9 month contract for us. He was Principal Investigator.

Biography provided to RADC and telephone conversation prior to his coming.

15 Based on resume to apply for the program and telephone conversation/pre visit

Through another professor at the associate's university

We attended meetings on controls and structure

He had been a student [illegible] at the same time

I met him while he was [illegible] summer program at RADC [illegible]

He was my [illegible]

[illegible]

Supervised his research in the area of Material Behavior Modeling.

Graduate school - have known for 9 years.

He had previously worked with us as a visiting scientist.

Knew of him as a graduate student at Texas A&M, then he came for a visit this spring.

He visited our lab approximately one month prior to his arrival.

Personal interview one year ago when he originally applied for this program.

He was a thesis advisor for one of our staff scientist and is a professor at University of Dayton. I met him in 1981 when I gave a seminar at U.D.

Through several extensive phone conversations, I was informed in some detail of his formal training and research experience.

She spent the summer of 1983 here on an AFOSR program. She and [illegible] collaborated an reserach.

We have had previous contractual efforts.

Had a series of meetings with him after he was [illegible] selection.

He submitted his C.V. and visited the laboratory [illegible] program for the summer.

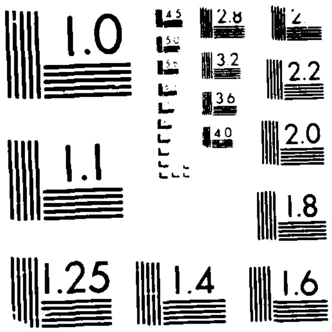
I knew him when I was a Research Associate [illegible] and he was a graduate student. We [illegible] together.

Through several extensive [illegible] some detail of his formal [illegible]

Telephone [illegible] activities.

[illegible]

AD-A191 120 UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH PROGRAM 2/4
(1987) PROGRAM MA (U) UNIVERSAL ENERGY SYSTEMS INC
DAYTON OH R C DARRAH ET AL DEC 87 AFOSR-TR-88-0211
UNCLASSIFIED F49620-85-C-0015 F/G 5/1 NL



MICROCOPY RESOLUTION TEST CHART

He did a site visit prior to work start - this allowed discussion of experience.

Met him at AIRES meeting, when he presented a paper.

Read and discussed with him his doctoral thesis on tire/ground surface interaction which was done at the University of Dayton.

He has been involved in reviewing proposed identification case fiber for remains returned from Vietnam. He also conducted a training course for OEHM identifcation team.

He often teaches short courses in optical computing at SPIE meetings (1986) and at Wright State University; therefore, he is suited to the subject investigations.

He used to work at Georgia Tech. AADM has had contacts with Georgia Tech.

Had followed his recent research work.

Through both his and my active involvement in several local AI professional societies and meetings over past 3 years.

Met at AI conference and met with him several times before his arrival.

Known him, his work, his students at University of Cincinnati for several years.

During personnel interview and technical interchange of electronic warfare needs and requirements.

He visited AFAL prior to applying for the Summer Faculty Program. We had a 2-hour discussion and I obtained limited knowledge of his capabilities.

He worked at Hercules prior to going to University. He worked on A.E. at Hercules on monitoring cases doing Hydroproof testing with A.E.

Literature, followed by personal academic contact.

As an adjunct professor at Ohio State I gave lectures in 1986 and Prof. McGee participated as research associate.

He was known to us for a number of years because research in controls.

I knew him while at the University of Texas at Austin, and conducted research with him while I was there. During this time I came to know of his interest and expertise in organizational issues such as personnel selection, career development and turnover.

Began discussions with Associate approximately 30 days prior to arrival; had project defined by arrival date.

He has worked on various aspects of MSW (magnetostatic waves) with RADC/EEAC, under various programs, for the past ten years.

2. <u>Was the Faculty Associate prepared for his project?</u>
YES - 149
NO - 6

3. <u>Please comment on his preparedness, competency, scope, depth of knowledge of subject area:</u>

He had conducted a literature survey and was familiar with related work.

Preparation was as well as could be expected. Professional and competent scientist with a growing depth of knowledge in subject areas.

He is a competent researcher. He was not trained in the use of FTIR, I knew that from the start. He learned fast and did an excellent job under very difficult circumstances. The instrument continually malfunctioned which made it extremely difficult to perform very meaningful research. The was <u>not</u> his fault.

This was an opportunity for him to branch into a new area of research. He had performed a literature review and studied key research.

34 - Excellent in all categories.

He had started preparing long before he was officially accepted in the program, we made initial contact 1-1/2 years prior. He was extremely able and knowledgeable in this area.

He had experience in the control of nuclear power plants. He did a fine job of applying his control theory expertise to the tactical missile problem.

He had a clear idea of what he wanted to pursue, excellent knowledge of the literature, cooperative with all the staff members he interacted with on a daily basis. He made good use of his time.

Had one project well in hand upon arrival and completed it, as well as some progress on another to which he was introduced here.

Had not given much thought to project before coming. Consequently, did not reach the scope or depth we would have liked.

Came prepared to address chosen topic but broadened scope while here.

Well prepared, brought his own computer and an extensive collection of technical reference material.

He had performed experiments the previous summer which had a direct bearing on our program.

There was little other than reading, that he could do to prepare. He was working in an area related but not too closely with his previous research. He was sent reprints, etc., but it was not really his field.

He had done some prior related work, was well prepared in ballistics, and exceptionally capable in design.

He was knowledgable in the area of heterocycle synthesis, he was able to begin immediately on the syntheses required in our laboratory.

Excellent background and interests in digital image processing and advanced computer architectures.

He had a wide range of knowledge covering several aspects of our work. He proposed many new good ideas.

He had already done some work in the area and was able to get significant work done in this area from the first week.

He expressed knowledge of HPLC methods, but was slow to learn our Hewlett Packard System.

Technical competency good, but had not had time to prepare model and instrumentation requirements.

About 7 on scale of 1 to 10.

Had read literature in the technical area and knew fundamentals of techniques required.

He had a novel concept for controlling scew induced vibrations on structures. This fit nicely with our on-going work. He came very prepared.

He seemed very capable of performing his assigned research independently, once it was explained to him what was desired.

His theoretical and experimental background in holography and optical signal processing provided an excellent preparation for our work this past summer.

He had prior experience with infrared optical systems.

He is very knowledgeable in his field of applied mathematics. He was prepared for his work and quite competent in his activities.

She is the current expert in the area of a moving mesh chimere scheme.

Previous experience with subject area was very limited. A great deal of interaction and supervision was required.

Although knowledge of specific problem was initially average, background and experience gave him unique capability for rapid understanding, growth and contribution.

The FA requested and was sent literature concerning his problem area well in advance of his arrival at AEDC.

He has considerable experience and knowledge in physics theory.

He is a strong theorist with experience in optics.

He had had prior experience during his previous visit to the project we were working on and, while relatively new to the subject area, had a strong interest and did some background work in process control in preparation. The concepts of artificial intelligence approaches were difficult to grasp but he did a commendable job in the short time he was here.

Very competent person having a great depth of understanding in area of quantitative analysis of microstructures/property relations.

Well prepared and competent - set and operated a device that required a lot of perserverance and knowledge and ingenuity.

He was so well prepared for research in the group that within two weeks of arrival he coauthored new concept in features that is currently the basis for our ULCE work.

While not prepared he came up to speed rapidly and was a real contributor to the project.

He is an experienced researcher and has spent several summer's at National Laboratories working in areas directly related to our program here.

He had limited knowledge of assigned area but quickly and competently learned.

He has worked in this area of research for 15 years. He was very knowledgable and came prepared to start immediately.

Excellent engineering and reserach background to pursue task in kinematics robotics.

As a cytogeneticist and cell biologist, he was very well versed in viteo toxicology, possesses expertise in many critical technics and has performed research in a wide range of related areas.

Selected a manageable task for the allowed time. Planning for data extraction and analysis was excellent.

He had a diverse background.

He is a recognized expert in the field of Mathematical Psychology. He has a unique interest in developing mathematical concepts for applied problems. His interest and attention to the Air Force mission make him a valuable research asset.

He was exceptionally well prepared to do research in his area of interest. On the basis of the site visit we mapped out a research plan for the summer. In fact, programming of the experimentation was begun prior to his arrival so that data collection was started almost immediately.

He had read extensively on the subject of his research after his visit. He had an excellent background in cell biology and culture and needed no assistance in the required techniques. He did the needed background reading concerning work on the particular compound we are working with before he started his tour in the laboratory.

As a muscle physiologist and expert in protein analysis, by 2-D electrphoresis, he has a broad range of knowledge in physiological chemistry and related areas.

He was thoroughly prepared and competent from his academia experience. Prior experience at Arecibo and extent of prior research were most beneficial.

He is a very competent Mathematical Statistitian. His input to the discussion on the study ultimately directed the collaborative effort to its' resent form.

In 1986, he lost much valuable research time due to lack of prior coordination. This year he seemed to handle such requirements more effectively.

Well trained in dealing with human experimental subjects, he learned to use our instrumentation.

Average.

He is well establishes research physicist, who is known to work in moleculer diffusion. The reserach task was however in Roman spectrocopy but he learned to work in this area starting from basic principles.

Had to change focus after arriving did so very well.

She spent at least two months prior to her appointment researching her project and writing a animal protocol. She provide considerable knowledge and techniques associated with rat FEG recordings and the brain blower apparatus.

He performed a thorough search of the literature. He knows chemistry and science very well.

During the preliminary visit I supplied him with reference material. He has an extensive background.

The associate had studied the scientific literature in depth and was prepared to contribute immediately upon his arrival.

Identified areas he planned to address in beginning - and did not have to change concepts during the study.

Background included research on synthesis and structure of potential antineoplastic substances.

Knowledge of statistics was extensive.

He came prepared to start his research. He seemed to have a good depth of knowledge of subject area and very competent.

As a full professor in Electrical Engineering, he possessed all the background possible without actually working with HPM on a daily basis.

His background was well suited. Early in the period he prepared himself with extensive study, and acquisition of product information.

Although not an expert in ion chemistry, he brought a high level of expertise in organic and organometallic chemistry which has proved useful in some new areas of our work.

He had no background prior to preliminary site visit, but read material I provided at that time, giving head start on return.

Very knowledgeable in his own field (psychology). A quick learner at determining the interface between psychology and weather prediction.

Associate readily adopted complex mathematical concepts to relative issues in a timely manner.

Very competent in computer science - in this case in program-writing programs.

Knowledge of tropical meteorology was broad and extensive.

Very knowledgeable on CCD cameras, gave several insights to our electronics department on how to obtain more efficient read outs; associate worked well with scientists in helping to understand white light flares.

He is an internationally known expert in theoretical ion chemistry. His qualifications are superb.

He was continuing a project that he started under a previous summer. Thus, he was very prepared.

He used a TiCl4 laser sheet lighting technique to investigate the interaction of a wake from a bluff-body and the plume of a jet. He was very knowledgeable of this technique since on a previous SFRP he was involved in its development.

Very little preparation prior to arrival.

He had done related work in amorphous silicon solar cells and semiconductor devices.

Several pre-arrival phone discussions and pre-visit prepared him for initiating the research promptly and effectively.

He had an excellent theoretical and experimental background in mechanics required to study the low velocity impact phenomenon in composites.

He is a leading authority in gas flow and radiation heat transfer.

He is a chemistry professor at the Univ. of Montanta and recognized authority in ammunition powders. He is a certified handloader.

He was familiar with selected work in the proposed research and had accomplished some additional research in the area prior to his arrival.

Scientifically above average overall with unique capability in applying finite analysis techniques to aircraft tire/ground service interaction technology.

He was quite knowledgeable, had written finite element (thin) computer program previously and has strong background in unsteady testing in water.

He is well prepared in the area of nonlinear control theory. Optimal control applied directly on nonlinear systems will result in open-loop control which is not desirable. His research is to develop approaches that will give closed-loop control.

The faculty associate had a well-thought out research study prepared beforehand. Experimental procedures were modified only slightly for Air Force application. She has an exceptional grasp of her subject area.

Very well prepared. A real expert in structural dynamics and finite element analysis.

His background gave him excellent general knowledge of high resolution gas chromatogrphy and mass spectrometry. I was able to familiarize him with our problems with regard to fire training pit waste during his prelminary wait.

Very good physical chemist. Applied his knowledge to our problems very well.

He is a recognized expert in skeletal anatomy, has written several publications on skeletal anatomy which he brought with him. He also brought numerous human/animal bones to demonstrate differences.

He is an extremely competent researcher and he has demonstrated his wide scope as well as depth in the area of acoustics in general, and sonic booms in particular.

He displayed in depth knowledge of oil and chemical spill control and recovery, cationic and emulsion polymerization systems, organic reaction mechanisms and general chemistry.

He was well prepared to develop (initiate) RD's centrifuge program this summer.

He is a distinguished professor at Wright State University, is involved with artificial intelligence and neural networks. His prior employment at Texas Instruments allowed him to compare the new materials with those of Texas Instruments.

He has an extensive background in the theoretical analysis of microwave device and circuits. He has worked in the field for over 20 years.

Very good, well rounded knowledge of artifical intelligence and L.3p programming.

The participant came well prepared to work on the project and was very familiar with the contact and scope of the program.

As much as possible. We had discussed potential approaches and problem definitions.

Had done similar work on silicon. Was well prepared due to two prior visits here and good planning.

He insight and quick grasp of the electronics warfare problem focused the AI/ADA Research.

Obviously not prepared, but his abilities and quick perception minimized his "start-up" time.

The pre-visit assisted him in being prepared for the summer.

He was to the extent of having read relevant literature references I provided, but he had not performed experimental research in 20 years.

We worked together on a work outline prior to his tour here. He came prepared to start immediately with basically no wasted time.

He was prepared. His knowledge of our A.E. helped identify further problems and he resolved them for us. He was also helpful in setting up Mechanical Testing Equipment and Req. for the specimen.

He has done a considerable amount of work in the project area.

He was definitely the right man for our project - he had several years of practical and educational experience.

His education, background and temperament were well suited to the project. His special interest in Sperry Mainframe was invaluable.

This was a new area outside of his expertise.

This was a new area for the associate.

A leader in his field which is identical to ours - wave propagation.

He is a professional and is in the business of research for a number of years and he is well prepared.

He was already quite knowledgeable about career choice and personnel selection. Also, prior to his Summer Faculty appointment he prepared extensively in the areas of leadership and management. His broad-based competencies in diverse areas of psychology, and his strong conceptual focus, also helped prepare him to make a significant contribution.

He was very knowledgeable in his area of interest.

One of the best numerical analysts I have encountered in 25 years of experience. Performs complex analysis quickly and reliably.

He had done some preliminary studies, and had selected potential methods and specific topics.

4. <u>Please comment on the Associate's cooperativeness, diligency, interest, etc.</u>

Extremely cooperative, worked beyond what most would have been willing, was interested in work and developed interest by other researchers.

He was cooperative in all respect with this office. He worked hard and his research is proving very useful (based upon current experiments).

He was very cooperative, diligent and timely. He exhibited a proper amount of interest in making his time beneficial.

He was very cooperative and interested in the project and he made a determined effort to carry out the research outlined prior to his arrival.

Extremely hard worker, highly motivated, very cooperative, listened carefully to Air Force needs.

25 - Outstanding.

He is a pleasure to work with and very cooperative.

He was extremely cooperative with all the staff members he interacted with on a daily basis. He made good use of his time.

Very positive and cooperative. Willing to do more than what was asked. Very professional in all respects.

Seemed to look at the summer research effort more as a job than as a chance to make a scholarly contribution.

Very cooperative, hard working etc., but needed some focusing.

Very cooperative. Responded well to suggestions. Hard working, spent many evenings and weekends in laboratory.

He was very cooperative, worked well with everyone and was interested in many other projects.

Very interested. Highly responsive to suggestions and direction.

He was very cooperative, and worked extremely hard on work directly related to our needs.

Very cooperative, eager to contribute, he worked very hard.

He always worked well past the normal duty hours.

He worked extremely well with our researchers in computational chemistry and came with an already developed interest in the specific research topic.

He normally worked longer than an eight hour day.

Very hard working and diligent - high interest in research subject.

About 7 on a scale of 1 to 10.

Became integral part of research group almost immediately.

Very cooperative and responsive to our specific inputs on this work. Tailored his program to match current and proposed plans.

He showed a great interest in working with us and worked very hard.

Outstanding and extremely dedicated. His enthusiasm was high at the beginning of the summer, but continued to build as we went along.

He arrived at his work station early and worked past normal hours.

He was very cooperative and diligent, quite frequently putting in extra hours and effort.

She was very cooperative and professional in all her activities at AEDC.

Associate was cooperative and worked very hard during his stay at AEDC.

The FA was interested in the problem area and was extremely diligent in digging into the problem.

He showed good enthusiasm and cooperation.

He is a very easy person with whom to work. He is enthusiastic about the project and continuing work.

He was very motivated and serious in working for us. He put in far more than the 40 hours/week he was obligated to provide and accomplished more than I would have thought possible in ten weeks.

Extremely cooperative. Worked diligently with high interest. Often worked late hours and sometimes on weekends.

Worked very hard and long hours too. Very cooperative - well motivated by topics of minigrant too.

He was extremely cooperative and displayed an excellent attitude and extreme interest in his research area.

He was very cooperative and professional in his interactions with myself and my group.

Willing to accept suggestions and follow through.

He was very cooperative and worked very hard on his summer project.

Very cooperative and diligent.

He was willing to cooperate on assigned work. He was very interested in assigned work since it had a "high" branch priority.

He was an excellent researcher in all aspects of his work. He is highly motivated and very productive.

He was very cooperative, dedicated & worked extremely hard to perfect a working delivery system for the lab.

Highly committed, cooperative and excellent work habits & organization.

He is a professional scientist, most enthusiastic, who enjoyed extensive hours of rigorous work at the lab bench. He was exceptionally productive.

She was very cooperative and worked tirelessly to accomplish established goals.

Easily worked into the collection of COPE laboratory scientists. Worked hard and even brought in personal computer resources when none could be provided.

His interest was in writing his thesis.

He is always willing to contribute in whatever way he can. His productivity is exceptional.

The associate was very cooperative, interacted as a colleague, was very committed and interested in the work, and accomplished a great deal.

Very cooperative, was diligent in accomplishing his research and displayed an active interest in other ongoing research efforts in the Branch.

He was extremely cooperative and worked evenings and weekends in order to accomplish more experimental work. His project required sharing time on several pieces of equipment and he worked well with the other personnel using them.

Very eager to learn and make best use of visit. Worked over 50 hours a week on tasks. Fit in very well with other team members.

He is an avid researcher, very interested in application of protein analysis to cell toxicology and an outstanding team researcher.

Did not require day-to-day supervision. Established contacts with AFGL and others as needed. Extremely interested in project and its value to USAF operational capabilities.

He demonstrated the above mentioned personal characteristics during several study planning meetings between the collaborating investigators.

He is a very enthusiastic researcher; eager to discuss reserach areas at length.

He was an outstanding individual, he was absolutely superior in all the above.

He is an exceptionally cooperative research collaborator.

Extremely cooperative, diligent and interested. An ideal colleague.

She was always available and anxious to help our program in anyway possible. She worked well with all individuals encounteres during her appointment (fabrication, veterinary sciences, etc.)

He worked very hard, couldn't have been more cooperative and diligent.

He worked for 8-9 hours every day. Never stopped. He also helped order supplies. Most important, he instructed my technician in use of the instrument.

She was very cooperative, interested, a good faculty member.

He was very cooperative and interested in our research program.

During the first 4 weeks of his visit, he assisted us in the completion of an ongoing project before initiating his own - outstanding team spirit.

He showed a true interest in the lab's work and instilled a cooperative atmosphere that allowed a free flow of information in both directions.

Associate's contribution to this program was all of the above and played a crucial role in data analysis for court proceedings.

He displayed a very high interest on problem areas within the lab and always seemed very cooperative with his peers.

He was highly motivated to do a good job and he did, indeed, do a terrific job. He was an inspiration to everyone here.

His thoughts, from the moment of arrival, centered on the technical problem presented to him for solution.

She was outstanding in her attitude and efforts, with great interest in the area of parallel computing and desirous of cooperating fully with local workers.

Very cooperative, diligent interested and committed.

Only possible criticism would be that he could be considered overzealous. He kept expanding the scope of his effort, and had to be reined in. For the time he spent here, he produced a tremendous amount of good results.

Associate was very enthusiastic about project; this was evident in all aspects of his work.

Very cooperative - provided a computer programming software facility useful to the entire laboratory - easy to work with.

He was very cooperative and was keenly interested in carrying out research which was of interest to the Air Force.

Interacted with our people and very cooperative.

Associate interacted vigorously with both scientific and technical staffs, made many suggestions and established several collaborative programs for the future.

As always, he was very cooperative, exceedingly diligent and showed his great interest in the research.

He was very interested in the research project and worked diligently at it. He was also very cooperative and worked well with other researchers.

He displayed enthusiasm and a spirit of cooperativeness in working on this research project.

The associate spent considerable time and effort looking for a job both here and elsewhere - during the 10 week period.

He worked very hard to get the project off the ground.

Very cooperative. We were able to quickly arrive at the objective and scope of his and his graduate student's summer work.

Very professional approach.

He was always cooperative. He showed keen interest and displayed lot of ingenuity in the area of the study.

He is diligent in his chosen area of research. He interacted very well with members of our group.

He was (is) extremely cooperative and very effective during his work here.

Very positive. His comment was that "he invested much more of his time in this task compared to his previous participation in the SFRP." He was very dedicated and interested in the task we mutually agreed upon at the beginning of his work period.

Much above average in all respects. Could not ask for a better person to work with.

I found him to be intensely interested in this area and quite conscientious. Motivation was not a problem. Required very little guidance. Self starter!

He was always willing to listen to new problems to approaches. He was so active that during his short stay with us, he made contacts on his own and held technical discussions with personnel from FIG, FIB, ASD/EN and the Propulsion Lab.

She has great interest in the 6.1 Basic Research program on learning abilities and was willing to serve as consultant to other programs within the AFHRL.

Very cooperative - good open discussions.

Probably the most cooperative summer faculty member RDC has had (and we have had several excellent ones recently).

He was very cooperative and shared a keen interest in his project. He was also quite diligent, to the point of frequently working well beyond normal working hours.

His interest was in all areas to better understand problem areas he could assist with. His willing attitude was to learn as well as teach.

He was cooperative and quite eager to help out the center personnel even in areas other than sonic booms.

He was willing, cooperative and very professional in all associations in RD.

He was very cooperative. The lack of fully functional equipment required his diligence and interest to keep the program moving.

His interest and dedication to our project was outstanding.

Very cooperative and intent on producing useful research - will carry on this summer's research back at his university.

The associate worked hard, was very cooperative and extremely interested in his work.

Discussed his project as it evolved with many government and contract personnel.

Outstanding - being in close association with engineers and computer scientists has a cause and effect that leads to lively technical interchange.

He is a very hard working individual. He worked well with the AFAL personnel on the project.

The associate was very cooperative and interested in the project, but his diligence in working on it in the lab was less than that of some previous participants in our group.

He was very cooperative, showed interest in the worked being performed. He was a great help.

He was very cooperative and diligent. He showed a great deal of enthusiasm about the work he did.

He was a very hard worker who stuck with a problem until solved.

A super individual to work with - I would be happy to have him work with us again.

Totally dedicated. Sought out resources and raised issues without prompting. Aggressively immersed himself in the project.

He did a significant amount of literature work.

He was very interested in working his project. Once he finally got going he was hard to stop.

His diligency, interest and cooperativeness was also excellent.

Extremely hard worker.

Very cooperative and diligent. Highly motivated.

He was very interested and his effort and cooperative nature were favorably commented on by other branch technical people.

He is eager to participate in high quality research and very cooperative.

He was extremely cooperative, diligent and enthusiastically interested in our work. He worked closely with research and management personnel at AFHRL and often put in 10-12 hour days while he was with us. To ensure the quality of his efforts, he even made several extra trips to AFHRL after his affiliation with us had offically terminated.

He was very cooperative and worked very hard over the course of the ten weeks that he was here.

She was a very cooperative and diligent worker.

Appeared very interested in this effort and follow-on work.

Exceptionally cooperative and diligent in completing projects. Displays a clear interest in the present project involving MSW analysis.

Very cooperative and interested in doing the work appropriate to the group.

5. <u>In your opinion, has his participation in this summer program contributed to an increase in the Associate's potential to perform research?</u>

YES - 145
NO - 10

<u>Comments:</u>

He is an experienced researcher who applied his talents to an AFATL problem.

He should have a greater depth of understanding of problem areas that exist in RDT&E installations.

He now has knowledge of FTJR technology that will be extremely helpful to him at the university as they plan to purchase one.

His capability to perform research was excellent prior to his arrival - the program did however enhance his capability to perform research in the area of testability.

The area of flexible body aerodynamics still has a lot of work to be done and his summer experience aids significantly in that area.

He intends to continue doing research in the guidance and control of tactical missiles.

We provided an applications - orientation to a theorist.

He was competent before. I think he gained an appreciation and understanding of military R&D and how his own research interest relate to USAF concerns.

Completely objective. He arrived with a large potential, and realized it.

He can now move into other areas of interest to us and has made a significant contribution to EO research.

Now the associate has a basic background in the area.

Awareness of U.S. Air Force research objectives and understanding of our procedures for implementnig research programs.

We intend to follow-on.

He became familiar with a research area and methods which were new to him. He found this extremely interesting and indicated his intent to pursue it.

Now has good understanding in the area especially the "real world" constraints related to Air Force problems in the area.

He is seeking research areas to pursue at University of Cincinnati and this summer's experience provided him detail knowledge in areas directly to his research interests.

Has developed additional expertise in the area of high speed (M=2) unsteady aerodynamics.

Already fully qualified.

Some ideas we discussed might lead to areas of research.

He is now knowledgeable in a new area of research.

What was learned here is certainly a stepping stone for further work.

He is more aware of the types of research being conducted at the laboratory.

I think our work this summer has opened a new area of research for Prof. Knopp and his present/future students.

I believe he now has an insight into the rapidly developing area of infrared transmission via light pipes.

He gained useful knowledge of the environment in which applied research is performed. Developed new concepts and contacts.

Until coming to AEDC, the associate was unsure of the requirements for performing government funded research.

He was introduced to new areas of solid state physics.

He became aware of our needs and mission and helped define a particular material system to explore.

He has learned something about a new approach to some old problems and has developed additional skills (new computer language) as well as a basic understanding of real world manufacturing issues.

He should be considered for further support.

As a junior faculty member, he definitely gained group and team skills - will help him as an advisor too.

He has definitely found a common area of interest and understands our goals in feature modeling.

He will continue the work of the university and meet regularly with us to review progress.

Definitely.

He performed microstructure characterization on a new an unfamiliar material which will broaden his knowledge and research.

He became very familiar with our particular interests.

It has expanded the scope of his research program & opened up new areas to examine.

Has become intimately familiar with our research program objectives, approacher and capabilities.

He acquired theoretical and pragmatic capabilities in several techniques that can be applied to his other studies.

The area of her expertise and the project done here this summer definitely is on the cutting edge of her research.

Because it placed him in a quality ongoing project and permitted interaction with a competent set of research peers.

If the thesis is accepted, he graduates.

Through direct support to the Air Force program without academic he has the opportunity to become much more familiar with the Air Force research and how he can contribute.

It increased the associates potential to do applied research but his potential for basic research was already quite high.

Broadened his awareness of research topics of interest to the Air Force.

He does not have the necessary equipment in his laboratory to continue work on the project. However, he said it had allowed him the opportunity to sharpen his technical skills and may increase the potential to do research not requiring specialized equipment.

He learned several new data analysis skills and also learned about the design of a real-time flight simulation laboratory.

He has become very interested in vitro toxicology and intends to continue the studies initiated under the SFRP and based on the information and technqiues acquired.

Through intensive and extensive survey of literature, he has expanded his knowledge and expertise in an important area of upper atmosphere research.

I think that we all learned a bit from his experience here this summer.

It is difficult to determine if this experience has increased his potential to perform research; therefore I'll punt on this one.

Much experience gained; learned new skills; expanded his background of knowledge in applied physiology.

The experience has given him new experimental versatility.

New interests.

SAM faculty was very helpful.

I think so, however, he was an excellent investigator and scientist before he came here.

I think he benefited from the program. He learned a lot and was willing to learn.

She learned a considerable amount of information.

He had never worked with brain tissue. He now has an additional skill.

He came to us with a proven and highly developed skill for performing research. However, I believe the scope of his research interests were broadened.

He was better prepared than the program here could demand. Suggest AAMRL if he applies again.

Broadened his experience and knowledge.

Gave associate perspective on ground water quality issues and related data analysis.

His invention of a new impulse/mass-loss gauge puts him in a good position to further his research interests.

Has greater appreciation of the practical application problems.

He has learned some techniques in ion chemistry which will help him in his organic chemistry research. He is also now aware of some USAF needs to which he can contribute.

He applied himself very conscienously and learned much in the process.

Research in teaching programming techniques for rapid and accurate software developments.

The participant has collected and summarized many reports on tropical storms and has been able to focus on the most important aspects of the problem.

Associate learned new methods of dealing with CCD data and he was exposed to several models for solar white light flares.

His experimental work with us will provide him with a large fund of data for his theoretical grist mill.

Familiarity with Air Force and AFGL problems and people.

Summer work provided an excellent basis for future research.

He was exposed to an area where little research has been done - and much is needed. Sharing of spare parts across Air Force bases.

He investigated new theoretical concepts for describing turbulent processes. These concepts will be very important in shaping his future research projects.

He investigated new ideas for understanding the frequency spectrum associated with transition to turbulence. The potential of these ideas will have a positive impact on his future research projects.

He was given an opportunity to work closely with experimental challenges as opposed to his normal area - numerical computations.

The experience has permitted him to use equipment not available at his institution and apply those methods to current lubrication problems.

We have defined his research initiative as a result of his contributions.

He gained insight.

He has a clear understanding of the nature of the problem and knowledge to adapt related previous work he conducted to the solution.

With the background he had and investigations conducted by him during his stay, he has acquired necessary potential to probe further the low velocity impact phenomenon in composites.

He made significant contributions in our research. He has also benefited by our experiences.

The use of the government facilities increased his ability to work with equipment not available at the university.

It enabled him to get acquainted with the aerodynamic response problem from the flight mechanics viewpoint. He needed no improvement in the motivational/organizational aspects of research.

Unique work was done toward development of a 3D tire/ground surface interaction model which is needed in support of aircraft landing gear and the development of future hyperverocity vehicles and is to satisfy air/land battle 2000 requirements for aircraft that can operate on insitu ground surfaces.

He now understands that there is a great potential to apply his theory for flight control. I am sure that he carries this additional knowledge back to his university.

No, only because she is a senior researcher (full professor) and has fully developed skills.

He left with a new appreciation for our goals and priorities and a new awareness of our experimental capability.

He is already well able to perform research. Our association has familiarized him with an Air Force research base.

He has a better appreciation of AF research needs.

He participated in an aircraft crash with our identification team. He saw the problem that fragmentation presents to the identification team and is going to research that area to assist our needs. Fragmentation is a major factor in the Air Force having its own identification team.

The materials and techniques investigated during the summer will be subject to further study by both he and his graduate student at Wright State University.

The project work has expanded his understanding of current research in monolithic integrated circuits.

He has been introduced to techniques of Distributed Artificial Intelligence and Electronic Warfare application problems.

Associate became more familiar with some of the experimental techniques available in my group.

See his submission for mini-grant.

This research in EW gave tangible results as to various assumptions which effect the AI/ADA programming language efficiency. Undoubtedly, it will impact how she teaches the particular subject.

He had mainly performed theoretical research prior to his visit. The summer program gave him an opportunity to work with experimental data.

This program offered the associate an opportunity to restart a research program directed toward a specific goal and to regain some experimental expertise.

He investigated a very challenging area requiring much background investigation and concern for a new nuclear reactor concept. He identified surreal areas of concerns that will require additional investigations in the future.

The ability to use his expertise and the results of interpretation of data is now leading us to other areas that warrants further use of his expertise.

This program provided him an opportunity to study the damage mechanisms and fracture behavior in solid propellants.

Several collaborative publications should result.

The project laid the foundation for follow-on efforts.

This effort required some original thinking and developing a source of contacts and information sources that were not readily identifiable or available. He succeeded well in this area.

He increased his knowledge in distributed operating system and real-time techniques.

This man is a nationally known expert. He has gained a deep appreciation for Air Force biomedical wave propagation needs.

He got into a exitivy field of research in strutural optimization.

It established an AF Lab group contact.

He is an expert in Controls. His participation helped to get better understanding of structures area. His research is in integration of his disciplines.

Definitely! His exposure to the real-world concerns and constraints of research in the Air Force increased his sophistication as a researcher and heightened his ability to serve as a consultant in applied organizational settings. In addition, his intensive focus on selecting personnel with leadership and management potential expanded his knowledge into new areas.

Certainly helped his understanding of government sponsored research vs. academic.

He has progressed to the point where he can make substantial contributions to the technological aspects of MSW.

I think he has become involved in a new area, and one of which may lead to some useful research.

6. Did work performed by the Associate contribute to the overall mission/program of your laboratory?
YES - 153
NO - 2

If yes, how?

Contributed to our airbase/runway cratering technology.

Results of work performed will be useful in mission support applications.

It contributed to the Basic Research Program at the High Explosives R&D facility in that FTIR spectra of new species were provided.

Emphasized another viewpoint of a very complex problem.

Developed a rationale for testability demonstration which did not exist prior to his work.

Expanding the analysis capability in areas previously not considered.

He was able to get our modern-control-theory autopilot design methodology software checked out and running.

Advanced our knowledge of electro optics.

His was expanded our capabilities in terms of adding reaction time capabilities to our computer programs. Results also suggest another potential area of research for our program.

Some contribution to test generation theory. Similar effect on supply current test methods.

Basic research which is essential to our long-term goals/mission.

Literature review uncovered useful information.

Worker interaction new ideas, good sounding board.

Confirmed value of ongoing and planned efforts. Made suggestions for new efforts to enable emerging technology.

First practical test facility.

He performed an experiment which was directly related to our ongoing program and provided knowledge in advance of when we could have had it without his participation.

The study he prepared paved the way for the SOW/specification effort this fall.

Was a major first step; obtained data extremely helpful in terms of requirements, which will aid in future program formulations.

The compounds synthesized will now be studied by our mechanistic chemistry group.

Increased our knowledge of parallel computing architectures and help structure a T&E program.

The work done will be continued and expanded.

Our computational chemistry program MOPAC has had important enhancements added.

The initial study will be followed up.

Contributed knowledge in transonic and supersonic regimes of unsteady flows.

Added significantly to progress in mainstream of research project.

Increased our ability to work with small selections of fibers.

He explored a new avenue of research we would not have followed otherwise.

Identified techniques for enhancing precision pointing performance - that is our mission.

Helped to complete an innovative computer code for radiation transport.

His assistance was instrumental in our successfully demonstrating imaging correlography this summer. This was an ILIR funded program.

In the area of space environmental simulation, there is a great need for developing methods for IR transmission via light pipes, and the work he has contributed to the theoretical basis for that development.

Initiated research into a promising new algorithm for CFO.

AEDC requires a moving grid chimera scheme to support stone separation testing and analysis.

An upcoming test program requires control of tunnel turbulence, and the work performed provided information concerning possible control techniques.

The contribution is marginal at this time because it took the FA the entire 10 weeks to come up to speed on the problem. This is not a derogatory comment about the FA but rather the problem was too tought to solve in 10 weeks.

It supports our new thrust in non-linear optics (NLO).

The programs which he and his graduate student worked out can be used in development of process and sensor understanding.

He wrote an interim report on processing of TiAl and tied-together the efforts of several engineers.

Took data on fundamental problem in our branch, and will publish it. Got a difficult machine set up and operable.

His research in the structure property relationship of selahydrocarbon and chlorotriflyumethylene oligomes was very important to our research progress in these areas.

A new concept in fundamental primitures for feature modeling.

By investigating a high risk area that no-one had the time to do.

He developed techniques and interpretations for determining crystallography of thin films which we previously could not do.

Performed experiments of interest.

His participation contributed on advancing the development of titanium aluminides.

Improved our analytical modeling capability and helped plan experiments.

The lab we get a new steady state system for delivering a solvent for pharmacokinetic testing.

Provided incisive review and assesment of methods for kinematic analysis to be used in our human kinematics and robotics programs.

His efforts resulted in increased productivity of the Cell Laboratory and contributed to the development of an in vitro toxicity test.

Provided supplemental analysis to ongoing research that would not ordinarily been done.

The research addresses the basic underpinnings of human interactions with "expert systems". Systems of this nature are being developed and related human factors considerations are included in our laboratory mission.

He attempted to address issues relevant to the AF Laboratory in the context of his area of interest.

Contributed to our efforts in signal processing and provided pilot data for planned effort in neural networks.

The basic research program in this laboratory includes studies on the toxic mechanism of fluorinated hydrocarbons in vivo. The work done by him utilizing the vitro techniques complemented the in house work.

He brought many skills which he taught to other team members. His suggestions for the redesign of our procedures are being implemented.

His efforts resulted in increased productivity of the Cell Laboratory and contributed to the development of an in vitrol toxicity test.

Provided the basis for initial estimates of meteorological impacts.

In two ways. First his statistical seminar will have positive influence on the mission of the School, and secondly, the pilot study that was completed during his stay will have an influence on the program of the laboratory.

Increase body of knowledge regrading the use of hyperbaric oxygen as a potential treatment of burns.

He was extermely valuable in both data collection and data interpretation.

We have started the exploration of a new polymer as a protein model.

Produced an alogrithm for morbidity-mortality anolyns in AFHS.

Examined a new area in software architecture-important overview.

She provided several techniques which were essential in developing a new animal model for the USAFSAM centrifuge.

Directly helped carry out experiments and possible heat stress with ground crew.

He initiated and completed all of the important research objectives.

Very definitely. He completely developed the complex analytical procedure and taught my technician how to do it.

She initiated and completed a very intense and valuable study.

We now have a functional neurochemistry lab.

His work allowed us to complete a major research project and to make significant progress on a second.

By performing needed research in an under-researched area.

Identified and recommended areas that required attention - it falls on command to implement.

His work provided the basis for defining future directions for in-house studies.

Conducted critical data analysis and related report preparation for court litigation.

We are doing research in expert systems and his research contributed to our effort.

His invention will be invaluable in the areas of interactive discrimmination, laser diagnostics and superconductor-laser interactions.

He examined the problem of extraction and contributed to its solution; he advanced the understanding of HPM sources.

Performed important study to scope practical types of balloon pointers and how to verify pointing.

He synthesized some organometallic compounds now being tested for use in modifying ionospheric plasmas.

Got an important task done, one that required dedicated effort, and some learning in dealing with new data.

Groundwork was developed which may ultimately lead to more accurate turbulence forecasts.

Modelling of background IR emission.

Provided a software facility for program writing for the AFGL VAX network.

He helped to define a research program in tropical cyclone specification.

Several CCD camera heads are being redesigned as a result of his comments. He generated considerable discussion and excitement both with regards to CCDs and with respect to our understanding of white light flares.

We now know how to calculate reaction rates for ion-molecule reactions at very low temperatures. We also know the rate constraints for reactions of oxide ions with several neutral species.

Analysis technique for an inhouse experiment already having many facets.

Direct contribution to our image processing interests.

It will help us to review software developed by a private contractor in a timely manner.

His approach to turbulence is providing new insights into the turbulent mixing and transport processes.

It has helped us understand the mixing processes occurring in complex flows.

It provided the analytical complement to our experimental effort.

Preparation and anlayses of high temperature candidate solid lubricant materials.

His work improved the understanding and interfaced stimulated our development to conduct additional modeling studing and experiments.

As a result of his stuies, he has identified areas of concern which need to be investigated.

His effort directly support the USAF Forecast II initiatives in Hypersonic technology PT024.

His work allowed us to achive both higher projectile velocities and increased the reliability at the higher velocities.

He put together a software program which we will integrate into our grid generation capability to CFD.

As a part of our 6.1 research we need to develop aero response models for arbitrary motion. Idealized models using empirical corrections will be helpful. His assignment of the "gormont" model is a step in this direction.

Wing rock is a phenomenon that may occur during high angle-of-attack flight. We now have an approach to control the wing rock. The approach is generic and can be appolied to any nonlinear dynamic system. ASTOVL is an example of a program that this research can support.

A new perspective on cognitive assessment was provided.

Performed first analysis of utility analysis, also proposed follow-on research that is critically needed.

Left a menu driven program to solve standard problems.

He helped develop a much-needed in-house capability to perform finite element analysis, in conjunction with his experimental work.

By clarifying questions about the composition of fire training pit waste.

Environmental fate of ground water containments was studied and new information discovered.

Discussed problem cases and his professional opinion as to how good or bad our findngs were.

Provided answer that ozonation was not a good total treatment method, gave insight into treatability of Firefighter Training Facility Wastewaters.

He established certain deficiencies in the state of the art for us and this helped us in prioritizing our planned research program.

Theoretically, solve the ambiguity problems in IFM receiver design.

His efforts provided a qualitative feel for electron trapping materials (ET) and defined problem areas that need work on the new materials.

He worked on the GaAs Materials/Service Correlation program. This is a very important project and will impact the MIMIC Tri-Service program.

He aided our work under the ILIR "Intelligent Mission Adaptive Controller."

He worked in the research area that he has a great deal of interest in.

His research goal is an excellent understanding of the fundamental issues and approaches to verification and validation of artificial intelligence software.

Will help identify processing parameter tolerances.

He worked no radiance interpolation, a key ingredient in the inversion problem.

His work contributed towards developing parameter estimation techniques for future space structures.

There were some complications found in reproducing certain literature reports of syntheses of interest to us.

We are looking at nuclear propulsion for Air Force Mission in space. A new concept has been proposed which could greatly enhance our posture in space. The associate evaluated the concept and identified major issues.

His understanding of the capabilities of A.E. to follow on set of damage.

He identified the important area that needs to be studied in order to get a better understanding of fracture behavior in solid propellants.

Contributed new research ideas.

The Construction Handbook developed by him will help solve a long standing AF problem for inexperienced contract administrators.

It answered fundamental questions concerning policies we should pursue. We have a much clearer notion of what is possible.

Provide some direction for future planning.

He defined the technology base and research direction in real-time database system.

Made a major inroad on long standing research problems.

His academic capability and experience were both useful.

AFOSR has a new initiative in Dynamics and Control and his work enhanced this initiator's objectives.

Significantly! His efforts encouraged AFHRL personnel to explore possibilities for enhancement of the Air Force officer selection system. He and his associates were therefore a center for innovation. His efforts culminated in an excellent end-of-summer briefing for AFHRL personnel, and two symposia at the annual meeting of the Texas Psychological Association convention.

His work may lead to a metric that allows us to measure changes in performance as a result of training or practice.

Brought expertise not available in-house to get a high priority USAF project.

Resulted in useful computer programs, which are regularly used by EEAC. I consider his programs the best in the country.

It is supportive of our millimeter wave programs.

7. <u>Would you classify the summer effort under the SFRP as research?</u>

YES - 143
NO - 12

<u>Comment:</u>

Addressing/defining new phenomena.

To the extent that the task and subject matter need specialized and dedicated attention.

The summer term is generally too short to complete many complex research efforts.

Some of his work will be presented at the 1988 American Control Conference.

New ground was broken.

Journal artical prepared for IEEE Training on Computers, "Value Assignment Implication Constraints in Combinatorial Logic" - geared for public release).

3 - Definitely!

Preliminary research effort; did not get farther than a literature review and proposal for research.

Concept formulation.

Extensive review of literature led to definition of work that will improve our ability to exploit photonics technology.

For this effort, an excellent stand of theory and application.

A paper will eventually be published incorporating the work.

Study of advanced (SOA) computing architectures.

The work will eventually be published.

New fundamental knowledge.

Explored a novel scheme.

We successfully demonstrated a new and before untried imaging technique.

A small experiment was performed to demonstrate and obtain baseline data for several turbulence control techniques.

Basic questions of process control and modelling were investigated.

6.1 type research in processing science.

Excellent. Gave us a different view.

We hope to generate a technical report on his work.

The effort normally involves laboratory experiments.

Some was background study but most was model development.

A system was developed, tested & refired.

A research report is in preparation.

Hypothesis were stated and attempts to prove same.

The research included an experiment to address basic understanding of human decision making.

He and myself conducted 3 experiments.

Some was analytical.

A research report has been received.

Effort is definitely at basic research level.

The pilot study that was done this summer has the potential to make a contribution to the field of human response to accleration stress.

Would not be possible without previous planning.

He synthesized new derivatizing reagent to be used for new analytical procedures.

I do not feel this is pure research - more in the line of investigative study.

There is only a limited amount of document research on a topic.

Data analysis.

The effort laid the groundword for research by providing familiarity with an area of parallel computing.

He provided the gas phase ion chemistry of several epoxides. This is certainly very basic research.

Data reduction of experimental data - "morphological research".

Research in techniques for increased speed, accuracy and convenience on scientific programming.

Some of the effort involved a literature search and summary.

Both his theoretical and experimental work is truly basic research.

He developed new material.

At least one and probably two journal publications will result from this work.

A journal publication will probably result from this work.

Original work performed in preparation of solid lubricants.

Most efforts are, this one didn't progress very far.

Basic research.

Research consisted of modelling of a structure and understanding not previously attempted.

Consisted of in-depth literature review and problem formulation.

No previous work in this area is known about at FIES.

Advanced concepts had to be developed and verified as part of developing the finite element code.

Ten weeks is not a long time. His work has opened the possibility for profitable avenues to pursue (always a good result of research).

He used finite element approximation to convert a 2-point boundary value problem into an on-line closed-loop sub-optimal control law computation.

Too little time to perform real research even if we had all summer. I believe that this summer will launch a real research effort.

Studied hydrolysis of chemicals previously unstudied.

Researched our means of identification and will further research needed means of identification of fragmentation.

More like pre-organization for upcoming research.

He tested existing parameter estimation techniques as to their applicability to future space structures.

Defining the scope of literature syntheses was useful.

New untried concept with many basic issues.

Basic data gathering on the onset of fracture and fracture proprogation during testing.

The project was more of a literature review.

Resulted in concepts and models for real-time systems.

Yes of the highest calibre!

By its nature a one time associate will do research but with an exploratory development trend.

The summer effort constituted the initial stages of research, such as performing literature reviews, planning, laying a conceptual foundation, and generating interest in and support for the effort.

The work performed this summer was the preliminary work needed to set up a research project.

The work was primarily an analysis of the potential for the application of the hypertext concept to the automation of technical data. It provided a basis for research.

Definitely basic research.

Results are publishable in scientific journals.

8. <u>Was a Graduate Student assigned to your group this summer?</u>
YES - 62
NO - 93

<u>If so, did this enhance the research productivity?</u>
YES - 50
NO - 3

<u>Was it an administrative burden?</u>
YES -
NO - 53

9. <u>Were your relations with the Associate satisfactory from a technical point of view?</u>
YES - 151
NO - 4

<u>Suggestions as to how they might be improved:</u>

Earlier selection and/or personal contact, possibly 12 week period rather than 10 weeks. Security clearance in advance.

I only wish I had more time for professional interaction with him.

An interview (in person) before the "offer" of the program to the professor would be beneficial.

Reduce the time to get the associate cleared to use AEDC computer systems.

The relation would have been better if the associate's background of measurement techniques and data reduction procedures for hot wire anemometry were required for this research.

We would have liked to keep him longer or had more time to visit and plan ahead before he came.

Wish I had more time to spend with associate.

Not Necessary - excellent communication established.

Outstanding association that cculd not be improved.

Preliminary communications prior to the arrival of associates would enhance both scientific and technical communications.

Relations were entirely satisfactory.

Sometimes he did the work away from our lab.

We had regular telephone contact for several months prior to the 10 week period. This is highly recommended to obtain maximum benefit from the summer assignment. The interaction is stimulating and brings fresh viewpoints to the in-house program.

Most satisfactory.

Outstanding association that could not be improved.

Ensure that the research does not have competing commitments i.e. Army Reserve duty plus grant commitments at another institution: too much divided time.

None, pre-visit took care of that.

Associate required a lot of time from myself and other AF personnel.

The program was run very smoothly.

Mechanisms for travel and path associated with travel needs to be better explained.

Student was too "junior" - just beginning graduate school.

The relations can be improved by permitting the associate to visit the laboratory once every two months for eight months following the visit.

We have many fruitful scientific exchanges of ideas with him.

Visits to the university to continue diaglogues could prove very useful.

We were heavily involved with planning and coordination (TDY) work while he was here. More time to interact (on a consistent basis) would be helpful.

A more detailed plan of work to be performed included details of equipment status, prior to the summer, would have enhanced the research.

The pre-visits to plan the project are very important and should be emphasized.

The technical association was extraordinary with the advent that this research can be continued on the classified level using real world classified data it will be ever more productive.

Longer association.

He was technically competent and worked well with me and with others at AFHRL. He was considered a well seasoned professional.

Ten weeks is a very short time. It would help if we could bring the associate in for a week several weeks before they started the summer's work.

10. <u>Do you think that by having a Faculty Associate assigned to your group, others in the group benefited and/or were stimulated by his presence?</u>

YES - 146
NO - 8
N/A - 1

<u>Comments:</u>

In-house technical seminars were well attended and received.

Ours is a very small group and his FTIR tasks were helpful to me as the group leader.

Especially helpful for young engineers in the office.

We have young engineers which benefited from his knowledge and presence.

He could answer technical questions of others.

Exchange of ideas from related areas of research.

He was "sought out" for his insight by several on many occasions.

The work helped determine the direction of our future synthesis efforts.

He worked very closely with a junior engineer who learned much from the summer experience.

Several new projects were proposed.

The entire group will benefit from the MOPAC enhancements.

Interactions among colleagues stimulated discussions in areas therefore unstudied.

Participated in weekly group meetings.

He participated in all weekly group meetings.

We are better prepared for setting up future scew and pointing experiments.

He greatly contributed to an "electric" research atmosphere which produced outstanding results.

His work station was in an office with four physicists of the Space Systems Analysis Section, and they all seemed to interact well and provided advice and guidance.

A seminar and many personal discussions with group members were stimulating.

She worked closely with a member of our group.

The associate was not physically part of the group, his office was located in another building.

In this particular case, we were so very busy that we didn't have much time to spend with the FA.

He worked with experimentalists and supported their work.

Although some time was required for training, his progress was rapid and his questions often stimulated some thought and discussion.

He worked well with both junior and senior persons and expanded their knowledge base in quantitative metallography and analysis of structure evolution.

He participated actively in research meetings, etc.

He was an interesting person and brought new ideas into the group.

I have a young lieutenants who matured technically as a result of Ken Halliday's summer effort.

He contributed new ideas to the project.

A faculty associate is asked to give a seminar which stimulates discussion and is normally very beneficial.

Pharmcokinetic studies effect entire division & generate new ideas for all.

Technical discussions with new points of view introduced by SRF member were highly beneficial.

Other laboratory personnel were interested and worked with the FA.

He was very helpful in stimulating thinking on how our research program could be improved.

Not in a direct way because the limited duration of this program requires the participant to concentrate on completing his objectives leaving little time for casual interaction.

But I think that I benefited more than others in my group.

He discussed in vitro cell culture techniques with other scientists and technicians.

He is a gifted teacher and did stimulate many new ideas.

His close interaction with AFGL personnel expanded their awareness of meteorological impacts on the AIM.

His seminar was, I believe, well received by all that attended.

In this case no, we never saw him unless he wanted secretarial support.

This is always the case when outstanding people are present; he was an outstanding person.

Any organization can benefit from a physicist point of view.

Because of the technical interactions.

A number of my personnel were taught by him. I am indebted to him for this help.

My supervisor was very impressed with him, as were others. He established working relationships with those individuals.

I could notice an increased interest.

His work meshed well with our current project. Others did benefit.

He frequently entered into technical discussions with my research assistants.

Personal contacts and free flow of information during study and weekly "brown bag" seminars.

Research involved interactions a multiple disciplines within the laboratory.

Associate became part of the technical team and contributed accordingly.

A "new look" almost always helps.

Raised awareness of need for better pointing verification on all Attitude Control Systems.

He taught us some useful organometallic and organic chemistry with relevance to some AF needs.

The task accomplished contributed to the group, not just one individual.

The Associate actively solicited the opinions of lab personnel who, in turn, benefited.

Other permanently assigned software engineers benefited extensively.

He worked closely with one other scientist and interacted well with several others.

He interacted with Neidig on flares and with our electronics people on CCDs.

Everyone in the group benefited from having an expert theoretician present to teach us something about low temperature rate theory.

His work did not influence ours - yet, but he did contribute to our project.

He gave a seminar and had many informal technical discussions with our group.

General discussions of Operations Research topics as well as other research experience which he shared.

He helped other members of our group perform a heat transfer analysis on a radiating filament and contributed ideas to our spray combustion program.

He integrated very well into the entire group.

The potential for group stimulation with this SFR program is quite high, this one didn't quite live up to expectations yet.

New areas of research were explored.

He worked with several engineers in acquiring needed data and presented a briefing on his work at the end of the research term.

In discussions of problems, we were working-relating to similar problems he has investigated.

Time was short and the areas of interest were difficult.

The handloading techniques and test engineers benefited from his work.

There was a good mutual exchange between him and our group - it helped us both to do our jobs.

Others gained increased insight in an area in which they previously only had superficial knowledge.

Mildly, but set a good example with his dedication, but needed to do a lot of work on a computer terminal out of the office. This also cut down on interaction.

This gives a chance to everyone to get a flavor of academics. Otherwise, we have a tendancy to keep thinking in our old fashioned way refusing to see what the new developments have been.

He was able to work closely with myself, my assistant, and our summer student associate.

While here he interacted with other group members and contributed his experience.

He explained specifics in x-rays, reference books, skeletal exam to ID team members.

Developed interest in problem.

Got involved in numerous technical discussions directly related to various ongoing projects.

His enthusiasm for artificial intelligence and neural network leaves one feeling that optically based computers/processors may have a home.

The younger engineers learned from their association with the associate.

He assisted engineers in our group in learning AI and Lisp programming.

He was very helpful to several people in my group. He was a very experienced scientist and shared his expertise with the younger members.

Several junior engineers greatly benefited by daily interaction.

Inhouse program is large enough to benefit from his continued contributions.

He regularly participated in technical discussions.

The associate's presence contributed to the social morale of the lab environment this summer.

We held a seminar at the conclusion of the 10 week period, which was highly informative and well attended.

One seminar was given.

He sought the advice and recommendations from my entire staff and they willingly cooperated with him.

The informal discussions provided benefits in four other projects.

Due to personality conflicts other group members did not actively seek association with him.

Discussions and a seminar provided valuable interaction.

Fortunately, he is extremely outgoing and inspiring. He made contact with researchers and managers throughout the Laboratory and the Air Force. He included others in our activities, generating much interest. He also cultivated the professional development of less senior personnel.

Fresh blood, new ideas.

He freely and enthusiastically helps junior, and senior, personnel make use of the computer programs.

Yes - some, but there isn't much time available.

11. Do you feel that introduction to each other, together with the summer work experience and performance could form a sound basis for continuation of effort by Associate at his home institute?
YES - 145
NO - 10

If yes, how?

He is very interested in the technology area and expressed interest in further involvement.

Opportunities for consulting and/or technical efforts are available to professors familiar with our work areas.

Better understaing of Air Force needs - likely to submit more relevant proposal.

Work at home institute could probably be done to more fully exploit and develop what was started here this last summer.

He knows our needs.

We have already discussed future collaboratives efforts with him.

Associate intends to request support for continuation of some of the work initiated. Several potential research avenues were opened as a result of his work and discussions here. There is some possibility that an upcoming sabbatical could be taken here.

No doubt about it. He is primed and ready to follow-up our early efforts.

I would hope further research would get to the "meat" of the project.

Development of ideas and potential funding.

Investigation and definition of architectures for optically based professors is needed work. Associate demonstrated an ability and interest in such an effort.

By review of paper products (SOW/Spec, etc.) produced by ESMC.

Refinement of various things often "short-cutted" due to 10 work limit.

Many other compounds are needed for the effort and he is quite capable of preparing them.

Related follow-on research in some general area.

A number of projects vital to our overall effort were begun or worked on this summer.

The improved MOPAC can now be used to calculate compounds of interest to the Air Force Materials Lab.

The majority of the study must still be completed.

Exposed him to a new area of research not significantly different with respect to facilities at his home institute.

14 - Mini-grant.

He would like to pursue research on characterizing fibers at Howard University.

The techniques developed here were generic and very transporable for future work.

Continuation of work begun here.

He has developed, based on his introduction to our work, new approaches to solving our imaging problem. Also, his field test experience could prove useful in identifying key show-stoppers that may crop up in future developments.

His theoretical work needs to be expanded and followed up by experiments.

She developed a prototype code that still requires validation. This work provides a basis for the design of a research level code at AEDC.

The 10 week work period may not be enough time to work out a sophisticated problem but it is enough time to judge the abilities of the FA.

There is potential for future cooperation.

By extending the work that was started.

I think the seed of a concept has been planted and there are problems of interest to his university which will be using that concept. While ten weeks may not be long enough to fully grasp some concepts or complete an effort, it is certainly long enough to get communication going.

He should be given a grant for extending his capabilities through research and travel.

Mini-grant and mutual interest in Polymer Morphology.

His experience could be utilized provided facilities were available.

Visiting scientist program and contracted research.

It is being accomplished.

Worked well with other people.

We may be able to come up with some theoretical data analysis but he would not have the equipment to continue needed experimentation that he performed here.

It depends if the home institute is doing similar research, which is not the case here.

We envision a cooperative project where by experiments would be performed here and analytical work would be performed by the associate.

A graduate student will continue the work for her master's degree.

Methods reviewed should be explored in greater detail.

Support of his research by AFOSR or AAMRL to continue the studies initiated at TH.

By contract and professional exchange of scientific information.

Cooperative or parallel research are a real possibility.

His understanding of how his knowledge of basic resaerch can be applied and what additional basic research to feed into the applied research.

He has greater awareness of our interests and needs and I have greater familiarity witih his capabilities and the extent of his laboratory facilities at Univ. of Dayton.

Most definitely. Continued research is being planned.

Support of his research by AFOSR or AAMRL to continue the studies initiated at TH.

He has completed a preliminary analysis which will serve as a basis for arriving at computer solutions.

Future collaborative efforts but not with this particular researcher.

We understand each others interests, talents, and capabilities.

There is some develop in diffusion and the molecular dynamics studies by this organization.

Contracted research to continue his efforts on the same problem.

Maybe--depends on availability of USAF funds.

He will continue and expand on this important research.

By continuation of research under AF grant.

This could possibly lead to an effort to examine other transmitter system via HPLC.

We are actively collaborating on a project which we hope will be ready for publication in the near future.

By continuing research on current topic and/or others important to USAF.

Performing of similar projects at institution; ongoing consultation services, etc.

This program exposes researchers to our lab's problems and gives them something to think about.

We intend to continue the work through the mini-grant vehicle and other means.

Probable that a proposal or two will result.

The Associate has now gained some familiarity with both the technical area and the laboratory interests. This allows the Associate to approach future research with a more focused view.

Could develop a "frictionless" 3 axis test device for ACS's.

It would be useful if he could continue synthesizing some organometallic (and other) compounds for use in modifying plasmas of interest to various aerospace vehicles.

The Associate was looking for an opportunity to apply his knowledge and found one. However, the problem requires further study which the Associate is more than willing to provide, if given appropriate resources.

This effort closely associated with course development at University of Lowell.

He has defined a plan for further research which will be of help to the Air Weather Service.

We would like the Associate to design camera heads for our MDA development. Also he has set up a collaborative program to compare solar flares with stellar activity in an attempt to refine models of energetic flares.

I hope that he will be able to extend his theoretical work to the prediction of rate constraints at very high temperatures. This would have significant relevance to USAF needs.

A follow on study.

We intend to continue the association.

We have prepared new ideas for continuation of this summer's effort.

He has identified a particularly fruitful area for further research addressing problem of vital interest.

He has acquired broad understanding of composite technology along with specific needs to develop a mathematical model of the impact phenomenon and to verify it experimentally.

He now has a good grasp of the USAF's research need an has some unique insights.

Plans are underway to continue the work he started at FIES.

I think he could provide us with some good work in investigating some basic problems in computational grid generation.

Assignment of graduate students to thesis work in this area and further development of the associate's capability in the area of common interest.

Unsteady response research using the Ohio University two tank could fit directly into our 6.1 plan.

Through contracts, and invited lectures. We should write conference and journal papers together which forces us to get involved and continue communication.

Now that the faculty associate has an understanding of Air Force testing requirements she can gear her work to fill in gape in our research program.

First, we established a common jargon. Second, we defined the problems. Third, we discovered each other's capabilites.

He has several very worthwhile research areas that he wishes to pursue.

It has familiarized him with the problem of research and it has given him time to develop methods of examining the problem.

Continuation of the work started here is necessary and we do not have people here to carry on the work.

Fund his research project of fragmentation study.

Have used him as an information source.

He could possibly help through some small projects relative to the sonic boom research program.

In addition to the AFOSR mini-grant, we will attempt to obtain Laboratory Director's funds to solve some of the component problems for electron trapping based devices.

He plans to continue similar work to that done on the project at his university.

Carry on the research program.

The associate will continue the work started here on samples wherein we will provide.

Potential for research finding in the above area.

Exchange of samples and processed devices and data.

The need for comouter scientists and electronic engineers is critical, especially as applied to AI/ADA research and development for Electronic Warfare. She will be able to relate this experience to her students.

Basis was laid for continuing research on this important radiance problem.

The associate could continue exploring other estimation techniques under future AF/NASA/NSF funding.

Continued collaboration to follow up on summer efforts could be productive for both groups.

Unfortunately, we have been informed that the associate is no longer with his original home institute.

Hope to obtain co-op students at his university to work with us on some of our research projects.

Fund a research program which is directly related to my research and work closely.

Collaborative research projects have already been established.

We know what he can do for us and we know he is committed to quality. We would like to work with him under the mini-grant program.

More work needs to be done in this area. Continuity between projects would help by providing a building block approach to their overall impact.

Continued contract work.

To do real research a larger period of activity is required.

We think great possibilities exist for him to continue his involvement. Now that we are shifting from a conceptual foundation to instrumentation, he might contribute by developing instruments tapping leadership or management potential among officer candidates.

The computer programs *developed by him are* technologically valuable and will be for the foreseeable future. At his home institute he can further generalize them and make them even more useful.

If no, why not?

First, the associate is too far away for face to face discussion of problems. This makes it very difficult to discuss and explain complicated problems. Secondly, the transfer of knowledge, thus far, has been from AEDC to the associate only. We have yet to receive information that was generated by the associate on his own effort. Finally, the associate does not have the equipment to continue this work at home.

His school does not have the needed resources and facilities.

Technical complexity demands chosen contact; don't think teaching schedule allows for much time to do work.

Probably not - would require continued on-site visits.

Logistical burdens.

Would be yes if home institution were not filing for bankruptcy.

It would depend on his interests and proposal writing.

Cedarville College evidently does not have a mechanism in place for such efforts.

Still a way to go to become productive.

The home institute lacks sufficient research facilities.

Personality conflicts.

12. One of the objectives of this program is to identify sources of basic research capability and availability to the USAF. On a scale of A to D, how effective do you think this program will be in that respect?
(high) A B C D (low)

A 84 B 60 C 11 D

13. Also, please evaluate:

	A (high........D (low)
Opportunity to stimulate group activity	A 86 B 58 C 10 D 1
Professional association	A 98 B 49 C 7 D 1
Program administration	A 59 B 76 C 18 D 2

B. ADMINISTRATIVE ASPECTS

1. When did you first hear of this program?

4 - 1983.

14 - 1985.

15 - Several years ago.

6 - When it was first instituted.

6 - 1982.

15 - 1987.

Approximately 2 months before it came about.

13 - 1984.

4 - 1976.

Upon arrival at Seiler labs.

While at AFWL, I first heard about the program in Feb. 1987 when AR-1 brought around the proposed summer faculty candidates - Jerry was one of those candidates.

13 - 1986.

From announcement.

I was a faculty participant in 1980.

When submissions of interested researchers were circulated.

2 - 1980.

Through grapevine.

On my arrival.

1970.

3 - 15 years ago.

2 - More than 9 years ago.

From its inception in the laboratory.

The Computational Areas Group has participated in this program since it started.

The branch.

2 - 1981.

1978.

7-8 years ago.

Over the past 8 years.

Over 10 years ago.

2. <u>Were you involved in the screening and prioritizing of the faculty applicants for your lab?</u>
YES - 121
NO - 34

<u>If yes, do you have any suggestions for improvement of the procedures used?</u>

Provides material to the field whereby a measure of specialized recruiting can be performed by participating facilities.

It's a good procedure.

More personal contact with applicants prior to each of our prioritizations of personnel and labs.

He was the only applicant I know of in my area.

Get us the list sooner, if possible.

More lead time would be helpful.

We had extensive phone calls about research area prior to his visit.

All applicants should be screened at the same time - no more small bunches of applicants, please.

Present process is good.

Provide more time for final screening.

Seems to work well as is.

Applicants should be given sufficient information and time to submit tentative and brief proposal of research.

Persons responsible for summer associates should participate in their selection.

Proposals need to be as early as possible.

Not sure we get to see applications from all applicants we might have an interest in.

Current procedures acceptable.

Applicants should be given sufficient information and time to submit tentative and brief proposals of research.

Earlier notification of interested candidates prior to selection meeting.

Yes, prospective monitors should have greater input in the selection process.

(1.) Not enough time (less than 24 hours) to review. (2.) Someone arbitrarily sorted applications, so that I did not see all applications. Specifically, VN & NC received the biologist & R7 received the physicist. R7 does biology.

There should be some sort of organizaiton scientists prior to decision making.

More lead time.

Insure adequate time for evaluation and prioritization of candidates.

Become more active in advertising this program. We get a disproportionately large number of applications from a few institutes.

Perhaps make available publications authored by associate.

More detail on proposed research during the summer and encouragement to contact the lab before submitting the application.

We require the professor's application without preselection by UES.

More senior faculty should be encouraged to apply.

I would like to see more applications relevant to the Lab's in-house activities.

Standard resume packages.

Get applications to the labs sooner.

Keep this program in the laboratory. Researchers should not be isolated outside the divisions.

Worked well.

Publicize more.

Greater lead time to communicate with applicants and recommend appointments.

We almost lost the opportunity to have him with us. We need better communication within the Laboratory between Headquarters and Division, Branch and Function personnel.

3. <u>How do you rate the importance of the expense-paid pre-program visit to the work site?</u>

Not worth expense	5
Convenient	28
Essential	122

<u>Please add any comments:</u>

On-site work was necessary for the specific problem addressed by him.

Saves time and allows for direct interface early enough for better preparation.

Planned work can be discussed and the researcher will hopefully be better prepared to do the job.

Preliminary planning is extremely important because the 10 week effort is very short.

While not essential, it is very helpful and enables the faculty associate to fully understand the problem before he arrives full time.

Important if you don't know the person. It would improve efficiency during the 10 weeks.

Helps all get expectancics and be more prepared for summer research.

Resumes of young faculty tend to look alike.

Useful not not essential. Gets work started sooner.

It allows the research program to be discussed so the researcher comes with the background work already done.

Good introduction, allows work to be accomplished especially administrative-housing, familiarization, etc.) piror to start of 10 week period.

It allows background work to be done ahead of time.

It allows the researcher to start the 10 weeks with the background material already covered.

Direct function of the researcher.

Essential for people with no prior association.

It provided an essential fa e-to-face get together needed for establishing common research goals and schedules. Also, trip is needed to obtain summer housing.

With the pre-program visit, we were able to establish his work assignment and familiarty with the AEDC community.

On-site time is very short, and this visit provides an opportunity for the associate to become acquainted with the problem so that he can prepare prior to his 10-week stay.

Essential, especially for out-of-town participants. He is local so we had several pre-summer contacts.

Wish there were a few more days and a little more lead time so that a task could be planned in more depth.

We had extensive phone calls about research area prior to his visit.

Useful for the faculty member to get housing, etc., saves time at start of research work.

Lets researcher become acquainted with research area and comes to assignment better prepared.

I'm not sure it helps us but the applicant can use visit to assess adjustments and research commonality.

How else could you meet the candidate or allow the visitor to find housing.

Helped to get us a running start.

I think it is essential that the faculty associate knows what he will be working on and the people he will be working with.

Allows researcher to start preparations & be able to begin as soon as they arrive.

This is the only way to insure maximal use of limited time.

Allowed set up of summer agenda.

In order to accomplish anything significant in the time available everything must be ready to start as soon as the participant arrives.

This provides a way for a lot of the front end work to be completed before arrival - makes for a more productive 10 weeks.

The visit allows the faculty fellow to see the facilities and discuss his project in advance. Any preparation by the fellow or the laboratory can be done before he starts his tour.

Necessary for housing as well as research planning.

This is the only way to insure maximal use of limited time.

Well worth the expense to acquaint individual with research area prior to start of ten-week effort.

This visit was the spring board for the study that was conducted during his ten week residence.

An individual thing, some need it, others not. Phone call can determine the need.

We could use this money to set aside for emergency purchases during the Associates visit.

Especially for 1st timers.

Best way to identify common interest and to begin the planning of protocols. This is essential to make this appointment rewarding.

Helps in understanding mission, objectives, and in research planning. Essential. Helps me to modify program.

Helps in orientation, in understanding mission and current programs. Helps finalize options and understand capabilities.

Helps in orientation, background, understanding objectives.

It would simply be impossible to design, conduct, and complete a basic research project in such a short time without this visit.

Visit helps quicken the start-up during the ten weeks.

It is essential for both sides to meet and discuss programs and for the associate to find living accomodations.

It gives the person idea of what he is getting into.

This gave both the Air Force and the participant a good opportunity to clarify the summer research project.

We had little prior knowledge of associate - he gave a seminar that helped us evaluate his capability.

It is expensive to live in Boston, the visit helps the associate a lot.

This visit established the specific research program.

The previsit provides the time to choose a research topic and to get the experiment ready for when the summer faculty participant arrives.

10 weeks is too short without a pre-visit to plant the 10 week stay.

If the participant returns home and uses it to prepare for the effort.

This opens the door to the area and lets the associate think about it.

This allowed FIES to obtain some must needed research.

You need to establish a common ground and rapport with the individual.

The associate obtains significantly increased insight concerning USAF needs. We obtain better insight on the associate's capabilties and obtain needed technology at a very low cost.

This is when we lay the ground work and it saves us a lot of time later.

Helped us plan reearch effort.

An important area to me is establishing a relationship. It is difficult to communicate by long distance until you have met. In addition, we were able to pick background material which would have been difficult for him to find otherwise.

It allowed he and I to discuss his project and other vitally needed supplies and equipment.

Our supply system needs the lead time to procurement any special equipment or supplies necessary for the summer project.

The visit is essential to accomodate housing and familiarize working area and staff.

Prior to the summer it is necessary to prepare a detailed plan including equipment availability.

This is very important to the success of the program.

Invaluable to have research already aware of and thinking about research problem.

It helps prepare the participant to start his research work.

A pre-program visit is a must to permit an optimum match of talent to the requirement for the research.

The pre-program visit gives the faculty a head start on the work he will be doing during the summer.

The search for a place to live is most effectively done 3-4 weeks before moving out.

We were hurting financially to support our investigation and this proved to be a lifesaver.

It saves a lot of "getting settled/oriented" time once the candidate arrives to begin work.

The pre-visit sets the tone for the project. It helped establish the mindset and allowed for advance preparation. We would have lost over a week without it.

I never used this option.

It is by far the best way to evaluate applicability of project.

This was very important for it provided the Summer Faculty Associate with the opportunity to get a realistic understanding of our need and expectations without having to waste time once he came on board for the summer. Also provides a good opportunity to arrange for a place to stay and get to know the area.

4. Considering the calendar "window" of ten weeks (limited by varying college and university schedules), please comment on the program length. Were you as a team able to accomplish

more than	-	28
less than	-	19
about what you expected	-	108

Comments:

Could use more time.

5 - 12 weeks would be better.

Instrumental problems were continual and greatly curtailed the research effort.

By this time we know what to expect under program time constraints et al.

Ten weeks pass awfully fast.

Considerable programming work had to be accomplished and it turned out to be harder than originally anticipated. This was not SFRP fault.

Another couple of weeks would be useful, but probably not practical.

Should have option for extension.

Ten weeks is just right. Less would degrade program.

Due to equipment and programming, set up was necessary.

Good progress primarily due to his experience and hard work.

This is tough for experimental work instrumentation must be identical early because of long lead times.

This year we were still developing our lab facility which somewhat limited the effectiveness of the program.

I am a realist about what can be accomplished.

Of course we originally scoped an extremely rigorous and optimistic schedule. We accomplished what we expected but there is still plenty more to do.

The 10 weeks is sufficient if we develop a clear (and realistic) research program. Meeting at the pre-program visit is best used to orient the summer's program and to exchange research documentation and background material.

The ten week "window" essentially restricts an associate's work at AEDC to the theoretical/analytical arena.

10 weeks was insufficient time for more than prototyping.

Length of time was adequate.

This particular problem was too complicated to be solved in 10 weeks except that the FA were already up to speed on this particular problem.

I think this was primarily due to the enthusiasm and dedication of the individual associate. Unfortunately his task was not as well planned as it might have been because of the confusion over where he would be working and for who.

An interim report was written during this period and scientific conclusion drawn.

It might be nice to be more flexible - 6 weeks for some, 12 for others? Also repeaters should be allowed.

Slightly less than. I think it is very "natural" to set over ambitious goals when doing research.

Project was geared to 10 weeks - 15 weeks would be more desirable to accomplish a small research task.

12 weeks might be better.

Because of pre-planning activities, were as productive and successful as occurred.

I have done this several times and can now predict about what can be accomplished in ten weeks.

Stress importance of pre-planning.

If schedules permit any additional time could be put to good use. Given adequate preparation on part of both parties the 10 week window provides a valuable exchange of ideas.

Have had previous experience with the program - 10 weeks is a little short (12 would be better)but long enough if some pre-planning occurred.

More than expected was accomplished.

Because of preliminary planning, activities were as productive and as successful as occurred.

The time always seems too short. To bring someone in for ten weeks and accomplish something meaningful is a difficult task. That is why I believe that the pre-program visit is a necessary item. This is especially true in first time faculty.

Plans were made according to the limitation.

I would prefer that the length be adjustable to suit the summer schedule of the recipient.

Academic schedule is the driver.

Because this was his 2nd year.

He is a very hard worker. Accomplishes objectives.

Well organized. Accomplished two notebooks full of good data.

They worked hard everyday and accomplished everything that we set out to accomplish.

Pre planning essential! Lab must be ready when they walk in the door.

Additional time should be allocated to writing the final report before departure.

Time was adequate.

10 weeks is not enough to start from scratch, research, study and report even a simple effort.

Adequate for most but not all research endeavors.

Ten weeks is a very short time to learn and get the program off the ground.

My schedule left insufficient time to interact effectively. I was away for more than half of the 10-week period.

Because of extenuating problems associate arrived very late.

Ten weeks is about right to lay the ground work for a longer program.

Identification of a research topic can often take many weeks. It took much less time in this case.

To be successful one has to have everything ready when the associate arrives so that the research tasks can be performed within the 10-week period.

Time is too short for basically closing the research project within 10 weeks.

Additional time would be necessary to complete this task.

We scoped that task just about right. Work was actually completed about one week after he left.

Having identified the capability and given the chance to bring our in-house and their research into harmony, better 10 week efforts could be worked out.

We were very successful in defining our goals prior to the beginning of the visit.

Since this was our first such program, we believe we exceeded our expectations.

In this particular case the 1st week or two was used setting up and obtaining equipment and supplies. More and earlier site visits may help this problem since such a short time is available for research and reporting.

Unless specific plans are made ahead of time, 10 weeks is simply not a long enough duration to achieve any significant and measurable goals (at least on the first visit).

Ten weeks is a short time to develop new technology. Accomplishments were, for the most part, as anticipated.

We scoped the project during the pre-program visit.

10 weeks went fast, next time will be able to more realistically set up schedule.

We scoped the project to fill the time, more time would be desirable.

Although this initial program was exceptional, many more characteristics of the problem could have been explored in context given more time.

We could use more time. In research much time is necessary for defining problem and designing experiments.

Ten weeks is minimal, twelve would be better.

The faculty's prior familiarity with the computer software to be used went a long way in accomplishing what we did.

The goal was to evaluate a design and identify issues and we did.

Due to associate's professionalism we accomplished much.

I knew we were limited by time.

Would be nice if it were longer or at least more flexible. He worked 4 days, spending mid-week in Austin and extending his stay to 13 weeks. This was a real advantage to us.

The longer the better-how about a one year sabbatical?

He consistently accomplishes more than what is expected.

I suppose it could be 12 weeks, but that wouldn't help much. I think the mini-grant is essential.

5. <u>Would you desire another Faculty Associate to be assigned to you and/or your group/division?</u>
YES - 148
NO - 7

<u>If no, why not?</u>

In AD/KR one is sufficient, if graduate students are also provided.

The program required more time than I was lead to believe. My project did not have time allotted to participate as much as the program required. This made it difficult to keep up with contracted work.

The trend in this laboratory is away from research and toward testing and the resultant work environment is not conducive to productive interaction with academic type individuals.

But not as a suprise; there must be an agreement.

I have become too busy to do justice to the program.

We are too small to benefit from more people.

6. <u>Would you desire additional Graduate Students in this program?</u>
YES - 116
NO - 17
N/A - 22

7. <u>Should the Graduate Students only be assigned to research with the Summer Research Faculty Member?</u>
YES - 56
NO - 74
N/A - 25

8. Should Graduate Students continue to be assigned without Summer Research Faculty supervision?

YES - 83

NO - 49

N/A - 23

9. Other remarks:

His work was very productive for this laboratory.

Very good program.

The program is excellent, providing both the hosts and researchers with valuable information.

He also teaches undergraduate electronic courses which work on projects solicited from industry (small software/hardware system) for about $300.00. I have a project in mind and would like to have them buy.

Great program! Keep up the good work.

Program appears to be accomplishing precisely what it was intended to do. Acquaint faculty with Air Force research problems and put Air Force researchers in touch with talented people who are capable of doing useful work.

Overall, an excellent program which is well administered.

Good experience!

Working with the professor and the graduate student this summer was productive and extremely rewarding for our whole AFWL team. I'd love to see the professor back next year (with another grad student) and look forward to some common research on a longer-term basis.

I was lead to believe that definition of the problem and occasional status meetings would be my only involvement, and the associate would work on his own. In addition, to this, I had to locate office space and desks, help with a literature survey, suggest possible experimental setups, run an experiment and develop data acquisition and reduction procedures. Unless the local contractor's personnel are able to charge their time to the program, it is not beneficial for them to participate.

Ten weeks is a short time to solve much of a problem except that the FA has already solved a similar problem and arrives at AEDC ready to tackle the problem at full speed.

Graduate students work well under the supervision of qualified government in-house persons.

Good program - expand it!

Good program - administration is good - could be better but given the bureaucracy I have little hope.

Keep up the outstanding service to us.

He worked with me on a heat treatment study of titanium aluminider. He was enthusiastic and interested in understanding the processing/microsturucture/property relationship and its impact on aerospace systems.

Generally graduate students function very well without a SFRP since they (SFRP) are a drag on the system and just get in the way. The SFRP also are a duplication of supervisors.

This program isn't as long as some visiting science programs, so can't be expected to accomplish as much - but is a good way of establishing a relationship with universities. It is highly dependent on the quality of the researcher involved. I think it would be a mistake to depend on summer associates to support major research efforts because of the time necessary to train them on the problem at hand but it seems a valuable way of addressing small, specific projects and encouraging university research in specific areas. It is not necessary to have faculty associated with every graduate student. We often get useful work out of graduate students. On the other hand, it is very nice having the faculty member to help with the training which is necessary to get good research out of a graduate student.

Graduate student I had worked on a very different project than him and was extremely productive.

An excellent program.

This year, ESD only had one SFRP member assigned, whereas, in the past we have had 2 or 3. Request at least two SFRP participants be assigned in 1988.

It is my hope that provision can be made to have an Associate return for additional summer visits if it is mutually agreeable.

I think the program has significant merit; our experience this year will not deter us from future programs.

This is a very valuable program and I look forward to working with other outstanding scientist like him.

(1) Clarify policy on how follow-on grants are chosen. Needs a formal structure with input from the "bench". Review all applications at once, not on an individual basis. (2) Clarify policy on how many times an individual may visit the same laboratory.

Graduate students would not be of much help in this environment.

I had good experience with the participants and the managers of the program. Continue the good work.

He worked on some projects of interest with both individuals. His research was in a very important area to all of us and we were very excited about his accomplishments. We hope that we can continue with a mini-grant and transfer the technology to us. We need the help and the work has our highest priority.

His projects were excellent. I hope that his construction grant is approved. I know he can complete the work! He is one of the best faculty members that I've had and certainly the most productive. My supervisor was very impressed with his work this summer.

Program should be advertised more extensively to attract applications from top universities. It seems over 50% are from MeHarry in Nashville. This must be improved.

I think the success we experienced with him was due in part to his personal dedication, and in part due to finding a need well matched to his talents.

Graduate students who have come to PHS to work with our staff scientists have provided very useful contributions to our program. Many of these students have gone on to careers in solar research. We would welcome the opportunity to bring more students to PHS through this program.

The program has long continued to bring us top notch people who accomplish a great deal in a short time. It is essential to continue, and, if possible, to expand it.

This is a very good program - it needs the attention of in-house people to work well. There should be a clear understanding of who is to do what - we didn't do that as well as we should have.

Good program!

Howard came to us well prepared at a time when his skills could be readily applied to a problem which needed to be addressed.

This is an excellent program and should be continued. In fact, our in-house program would greatly suffer if the technical resources from the SFRP were not continued.

Good program.

The graduate student accompanying the faculty member must have MS to benefit from the program. This way he can identify possible areas of research for his Ph.D.

I am not sure we (the lab) really have the environment for conducting basic research. I do not know what other faculty members experienced, but he found out that he did not have ready access to computer terminals and personal computers. (He has ready access at the university). We are significantly short on these items. He overcame this problem by utilizing what we had when one was available, using the facilities over at the computer center, and doing a lot of work at night on his own computer. This problem of lack of equipment and adequate communication between terminals and mainframes is not unique to our Division, but is a characteristic of the laboratory. That type of environment is not conducive to good productive research.

Graduate student assignment to an associate results in a higher level of product production. Graduate student assignment without an associate provides the AF with increased knowledge of the student's capabilities and the student with increased knowledge of the AF mission as it applies to the AF organization he is assigned to.

Worked out well this year, and look like we will establish a working relationship (provided mini-grant is funded).

Although this is a fine program, there is still room for improvement. I suggest that AFOSR move up the award date by at least one month. I think that many of the best faculy have already accepted other offers by the time they got the offer from AFOSR. Personally, I rather work with faculty than with students. I would like to have two faculty next year instead of one faculty and one graduate student like this year. AFOSR should advertise more about this program. This may bring in more applications from faculty whose interests match those of the engineers in the lab.

Graduate students might be assigned to task scientists at the participating laboratories for research experience.

Very rewarding research was conducted by the faculty member. His follow-on grant would be extremely helpful and provide close contact with research.

The research staff can teach graduate students and high school summer students. We cooperate with summer faculty and have a basis of peer association. Summer faculty members usually don't learn new techniques, but instead apply ones they already know to new problems (ours).

I really like the program and have been associated with it for 10 years. I think it has definitely benefited our lab over these years.

He is the specialized professional type of exposure that is essential to our identification team. We can only avoid a wrong identification/decision by working/learning with the best.

Overall a very worthy program.

He is an excellent researcher and would be welcome to return.

Those students chosen should be under the direction of the faculty member. The desire to not use foreign nationals often results in less than the best graduate student being assigned.

I hope to participate next year.

This program has been of great benefit to me and to my people.

The overall program needs to be publicized more.

Graduate students tend to be more productive in the presence of their advisors, so this is preferable, but they need not be restricted to assignment only with the advisor.

He is a credit to Univiversity of Florida and the UES program. Encourage him to continue his participation.

Good program. We would not have done this research in-house.

It is, in general, easier to administer when a graduate student is working with a faculty mentor.

Provides an excellent opportunity for the Laboratory and for the faculty and students involved. Thanks.

The USAF/UES SFRP is a valuable asset for the Air Force Laboratories.

APPENDIX II

A. Program Statistics

B. List of 1987 Participants

C. Participant Laboratory Assignments

APPENDIX II A

Summer Faculty Research Program

Sponsored by
Air Force Office of Scientific Research

Conducted by
Universal Energy Systems, Inc.

Program Statistics

Program Statistics

1. Applications Received (by Laboratory)

Organization		1st	2nd	3rd	Total
		Choice			
AAMRL	(WPAFB)	43	40	17	100
APL	(WPAFB)	20	23	13	56
AD	(Eglin)	30	21	13	64
AEDC	(Arnold)	7	11	5	23
AL	(WPAFB)	21	23	14	58
BRMC	(WPAFB)	2	0	0	2
DEOMI	(Patrick)	25	8	17	50
ESC	(Tyndall)	37	23	12	72
ESD	(Hanscom)	13	14	9	36
ESMC	(Patrick)	1	4	7	12
FDL	(WPAFB)	43	9	8	60
FJSRL	(USAFA)	15	14	14	43
GL	(Hanscom)	27	6	7	40
HRL/ID	(Brooks)	10	16	10	36
HRL/LR	(WPAFB)	7	6	7	20
HRL/MO	(Brooks)	10	20	6	36
HRL/OT	(Williams)	6	4	9	19
LC	(WPAFB)	8	5	8	21
LMC	(Gunter)	11	13	14	38
ML	(WPAFB)	52	19	12	83
OEHL	(Brooks)	16	22	11	49
RADC	(Griffiss)	54	43	24	121
RPL	(Edwards)	24	25	17	66
SAM	(Brooks)	59	27	13	99
WHMC	(Brooks)	1	0	0	1
WL	(Kirtland)	41	37	19	97
	Totals	583	433	286	

2. Number of Participants - 159

Number with Bachelors Degree	-	1
Number with Masters Degree	-	11
Number with Doctorate Degree	-	147

3. Academic Ranking

Assistant Professor	-	50
Associate Professor	-	54
Department Chairman	-	3
Instructor	-	2
Professor	-	48
Researcher	-	1
Senior Research Associate	-	1

Program Statistics
Continued

4. Number of Participants at Each Laboratory

Organization

AAMRL	(WPAFB)	- 13	GL	(Hanscom)	- 13
APL	(WPAFB)	- 8	HRL/OT	(Williams)	- 2
AD	(Eglin)	- 9	HRL/LR	(WPAFB)	- 3
AEDC	(Arnold)	- 6	HRL/MO	(Brooks)	- 3
AL	(WPAFB)	- 9	HRL/ID	(Brooks)	- 0
DEOMI	(Patrick)	- 2	LMC	(Gunter)	- 3
LC	(WPAFB)	- 1	ML	(WPAFB)	- 13
ESMC	(Patrick)	- 1	OEHL	(Brooks)	- 5
ESD	(Hanscom	- 1	RPL	(Edwards	- 7
ESC	(Tyndall)	- 8	RADC	(Griffiss)	- 11
FDL	(WPAFB)	- 9	SAM	(Brooks)	- 16
FJSRL	(USAFA)	- 9	WL	(Kirtland)	- 7
				Total	159

5. Discipline Represented - 57

Acoustics	- 1	Hyperbaric Medicine	- 1
Aerospace Engineering	- 5	Immunology	- 2
Analytical Chemistry	- 1	Industrial Engineering	- 2
Applied Mathematics	- 3	Inorganic Chemistry	- 1
Applied Mechanics	- 1	Literature	- 1
Applied Physics	- 1	Mathematical Statistics	- 2
Applied Sciences	- 1	Mathematics	- 10
Applied Statistics	- 1	Mechanical Engineering	- 11
Astronomy	- 1	Metallurgy	- 2
Biochemistry	- 2	Meteorology	- 2
Biology	- 2	Molecular Biology	- 2
Biomedical Engineering	- 1	Nuclear Engineering	- 1
Business Admin.	- 2	Nutritional Physiology	- 1
Cell Biology	- 1	Optical Science	- 1
Chemistry	- 7	Organic Chemistry	- 5
Civil Engineering	- 5	Pharmacology	- 1
Cognitive Psychology	- 1	Physical Anthropology	- 1
Computer Science	- 8	Physical Chemistry	- 6
Control Systems	- 1	Physical Organic Chem.	- 2
Educational Psychology	- 1	Physics	- 14
Electrical Engineering	- 15	Physiology	- 2
Engineering	- 2	Psychology	- 8
Engineering Mechanics	- 2	Sociology	- 1
Engineering Science	- 1	Solid Mechanics	- 1
Exercise Physiology	- 1	Solid State Physics	- 3
Experimental Psychology	- 2	Statistics	- 2
Genetics	- 1	Systems Engineering	- 1
Human Performance	- 1	Theoretical Engineering	- 1
		Zoology	- 1

Program Statistics
Continued

6. Colleges and Universities Represented - Total 112

Adelphi University	- 1	Meharry Medical College	- 1
Alabama, University of	- 1	Memphis State University	- 1
Alaska-Fairbanks, Univ. of	- 1	Metropolitan State College	- 1
Alfred University	- 1	Michigan State University	- 1
Arizona State University	- 1	Mississippi State University	- 4
Arkansas State University	- 1	Mississippi, University of	- 1
Arkansas, University of	- 1	Missouri-Kansas City, Univ.	- 1
Auburn University	- 1	Missouri-Rolla, Univ. of	- 3
Bishop College	- 1	Montana, University of	- 1
Capital University	- 1	Montclair State College	- 1
Catholic Univ. of America	- 1	Morehouse College	- 1
Cedarville College	- 1	Nazareth College	- 1
Central State University	- 1	Nebraska-Lincoln, Univ. of	- 2
Cincinnati, University of	- 5	New Mexico State University	- 1
Colorado, University of	- 2	New York State, Univ. of	- 3
Dayton, University of	- 7	N. Carolina A&T State Univ.	- 1
Dillard University	- 1	N. Carolina-Greensboro, Univ	- 1
Drury College	- 1	Northwestern University	- 1
Eastern Illinois University	- 1	Ohio State University	- 5
Eastern Kentucky University	- 1	Ohio University	- 2
Eastern New Mexico University	- 2	Oklahoma State University	- 1
Fairfield University	- 1	Oregon Institute of Tech.	- 1
Florida A&M University	- 1	Oregon State University	- 1
Florida, University of	- 2	Ouachita Baptist University	- 1
Fort Lewis College	- 1	Pace University	- 1
Gonzaga University	- 1	Pennsylvania State Univ.	- 1
Grambling State University	- 1	Point Loma College	- 1
Hampton University	- 1	Puerto Rico-Mayaguez, Univ.	- 1
Houston, University of	- 2	Purdue University	- 1
Howard University	- 1	Rochester Inst. of Tech.	- 1
Idaho, University of	- 1	Rose-Hulman Inst. of Tech.	- 2
Illinois-Chicago, Univ. of	- 2	Saint Paul's College	- 1
Indiana University	- 1	San Francisco State Univ.	- 1
Indiana Univ. of Pennsylvania	- 1	South Dakota State Univ.	- 1
Iowa, University of	- 1	South Florida, University of	- 2
Jackson State University	- 1	Southeastern Mass. Univ.	- 2
Jarvis Christian College	- 1	Southern Illinois University	- 2
Jesm Baromedical Res. Inst.	- 1	Southern Mississippi, Univ.	- 1
John Hopkins Evening College	- 1	Southern University	- 2
Kansas State University	- 1	St. Louis University	- 1
Kansas, University of	- 1	St. Mary's University	- 1
Kentucky, University of	- 1	Talladega College	- 1
Lock Haven Univ. of Pennsyl.	- 1	Taylor University	- 1
Long Island University	- 1	Temple University	- 1
Louisiana State University	- 1	Tennessee Technical Univ.	- 1
Louisiana Tech. University	- 1	Tennessee, University of	- 1
Lowell, University of	- 4	Texas A&M University	- 2

Continued

Program Statistics
Continued

6. <u>Colleges and Universities Represented (Continued)</u> Total

Texas Southern University	- 3	Wichita State University	- 2
Texas Technical University	- 2	Wilberforce University	- 1
Texas-Austin, University of	- 1	Wisconsin-Eau Claire Univ.	- 2
Tuskegee University	- 1	Wisconsin-Madison, Univ. of	- 1
Utah State University	- 1	Wisconsin-Whitewater, Univ.	- 1
Walla Walla College	- 1	Wittenberg University	- 1
Washington State University	- 1	Worchester Polytech. Inst.	- 2
West Florida, University of	- 1	Wright State University	- 3
Western Michigan University	- 3	Xavier University	- 1
		Total	159

Program Statistics
Continued

7. States Represented - 39

Alabama	- 4
Alaska	- 1
Arizona	- 1
Arkansas	- 3
California	- 2
Colorado	- 4
Connecticut	- 1
Florida	- 6
Georgia	- 1
Idaho	- 1
Illinois	- 6
Indiana	- 8
Iowa	- 1
Kansas	- 5
Kentucky	- 3
Louisiana	- 8
Maryland	- 1
Massachusetts	- 8
Michigan	- 4
Mississippi	- 7
Missouri	- 5
Montana	- 1
Nebraska	- 2
New Jersey	- 1
New Mexico	- 3
New York	- 9
North Carolina	- 3
Ohio	- 24
Oklahoma	- 1
Oregon	- 2
Pennsylvania	- 4
Puerto Rico	- 1
South Dakota	- 1
Tennessee	- 4
Texas	- 13
Utah	- 1
Virginia	- 2
Washington	- 3
Wisconsin	- 4

8. Age of Participants -

Average - 42

APPENDIX II B

LIST OF PARTICIPANTS

LIST OF 1987 PARTICIPANTS

NAME/ADDRESS	DEGREE, SPECIALTY, LABORATORY ASSIGNED
Dr. Suresh K. Aggarwal Assistant Professor Dept. of Mechanical Eng. Univ. of Illinois at Chicago P O Box 4348 Chicago, IL 60680 (312) 996-2235/5317	Degree: Ph.D., Aerospace Eng., 1979 Specialty: Aerospace Engineering Assigned: APL
Dr. Gurbux S. Alag Associate Professor Dept. of Electrical Eng. Western Michigan University 1940 Howard Street, #410 Kalamazoo, MI 49008 (616) 383-1538	Degree: Ph.D., Systems Eng., 1976 Specialty: Systems Engineering Assigned: RPL
Dr. John W. Amoss Associate Professor Dept. of Systems Science University of West Florida Pensacola, FL 32514 (904) 474-2547	Degree: Ph.D., Electrical Eng., 1972 Specialty: Electrical Engineeering Assigned: AL
Dr. Victor H. Appel Associate Professor Dept. of Educational Psychology Univ. of Texas at Austin Austin, TX 78712 (512) 471-4155	Degree: Ph.D., Psychology, 1959 Specialty: Psychology Assigned: HRL/MO
Dr. Xavier J.R. Avula Associate Professor Dept. of Engineering Mechanics University of Missouri-Rolla Rolla, MO 65401 (314) 341-4585	Degree: Ph.D., Engineering Mechanics 1968 Specialty: Engineering Mechanics Assigned: HRL/MO
Dr. Francesco L. Bacchialoni Associate Professor Dept. of Electrical Engineering University of Lowell 1 University Avenue Lowell, MA 02173 (617) 452-5000	Degree: Ph.D., Ingegneria, 1946 Specialty: Engineering Mechanics Assigned: HRL/MO

Dr. Praphulla K. Bajpai Professor Dept. of Biology University of Dayton 300 College Park Dayton, OH 45469 (513) 229-3029	Degree: Ph.D., Immunophysiology, 1965 Specialty: Immunology Assigned: AAMRL
Dr. Vernon L. Bakke Associate Professor Dept. of Math. Science University of Arkansas Fayetteville, AR 72701 (501) 575-4531	Degree: Ph.D., Mathematics, 1971 Specialty: Mathematics Assigned: AL
Dr. Shankar S. Bale Professor Dept. of Science and Math Saint Paul's College Lawrenceville, VA 23868-1299 (804) 848-3111	Degree: Ph.D., Genetics, 1971 Specialty: Genetics Assigned: AAMRL
Dr. William W. Bannister Professor Dept. of Chemistry University of Lowell Lowell, MA 01824 (617) 452-5000	Degree: Ph.D., Organic Chemistry, 1961 Specialty: Organic Chemistry Assigned: ESC
Prof. Beryl L. Barber Assistant Professor Dept. of Electronic Eng. Tech. Oregon Institute of Technology 3201 Campus Drive Klamath Falls, OR 97601-7791 (503) 882-6321	Degree: MS, Electronic Eng., 1961 Specialty: Electrical Engineering Assigned: RADC
Dr. William M. Bass Professor Dept. of Anthropology The University of Tennessee 252 South Stadium Hall Knoxville, TN 37996 (615) 974-4408	Degree: Ph.D., Physical Anthropology 1961 Specialty: Physical Anthropology Assigned: ESC

Dr. Bryan R. Becker
Associate Professor
Dept. of Mechanical Engineering
Rose-Hulman Institute
5500 Wabash Avenue
Terre Haute, IN 47803
(812) 877-1511

Degree: Ph.D., Engineering Science, 1979
Specialty: Engineering Science
Assigned: APL

Dr. Charles Bell
Professor
Dept. of Engineering
Arkansas State University
P O Drawer 1080
State University, AR 72467-1080
(501) 972-2088

Degree: Ph.D., Mechanical Eng., 1965
Specialty: Mechanical Engineering
Assigned: AD

Prof. Kweku K. Bentil
Associate Professor
School of Building Construction
University of Florida
Gainesville, FL 32611
(904) 392-5965

Degree: M.S., Building Construction, 1975
Specialty: Building Construction
Assigned: LMC

Dr. David E. Betounes
Associate Professor
Mathematics Department
Univ. of Southern Mississippi
S.S. Box 5045
Hattiesburg, MS 39406-5045
(601) 266-4293

Degree: Ph.D., Mathematics, 1978
Specialty: Mathematics
Assigned: AD

Prof. Phillip A. Bishop
Assistant Professor
Area of HPER
University of Alabama
Tuscaloosa, AL 35487-9909
(205) 348-8370

Degree: Ed.D., Exercise Physiology, 1983
Specialty: Exercise Physiology
Assigned: SAM

Dr. Jerome W. Blaylock
Associate Professor
Dept. of Computing & A.S.
Texas Southern University
3100 Cleburne Avenue
Houston, TX 77004
(713) 527-7011

Degree: Ph.D., Computer Science, 1982
Specialty: Computer Science
Assigned: LMC

Dr. John W. Bopp
Assistant Professor
Dept. of Chemistry
Nazareth College
4245 East Avenue
Rochester, NY 14610
(716) 586-2525

Degree: Ph.D., Chemistry, 1984
Specialty: Computer Science
Assigned: AD

Dr. Kevin Bowyer
Assistant Professor
Dept. of Computer Sci. & Eng.
University of South Florida
4202 E. Fowler Avenue
Tampa, FL 33620
(813) 974-3032

Degree: Ph.D. Computer Science, 1980
Specialty: Computer Science
Assigned: RADC

Mr. Lee I. Britt
Instructor
Dept. of Physics
Grambling State University
Grambling, LA 71245
(318) 274-2575

Degree: M.S., Physics, 1978
Specialty: Physics
Assigned: AEDC

Mr. Richard H. Brown
Associate Professor
Dept. of Biology
Ouachita Baptist University
Box 3686
Arkadelphia, PA 71923
(501) 246-4531

Degree: M.S., Physiology, 1963
Specialty: Physiology
Assigned: OEHL

Dr. Robert A. Buchl
Assistant Professor
Dept. of Physics & Astronomy
Univ. of Wisconsin-Eau Claire
Eau Claire, WI 54702-4004
(715) 836-2272

Degree: Ph.D., Physics, 1971
Specialty: Physics
Assigned: AD

Dr. Charles M. Bump
Assistant Professor
Dept. of Chemistry
Hampton University
P O Box 6483
Hampton, VA 23668
(804) 727-5330

Degree: Ph.D., Organic Chemistry, 1979
Specialty: Organic Chemistry
Assigned: FJSRL

Dr. Allan R. Burkett
Associate Professor
Dept. of Chemistry
Dillard University
2601 Gentilly Blvd.
New Orleans, LA 70122
(504) 283-8822

Degree: Ph.D., Inorganic Chemistry, 1972
Specialty: Inorganic Chemistry
Assigned: RPL

Dr. Ronald V. Canfield
Professor
Dept. of Applied Science
Utah State University
UMC 42002601 Gentilly Blvd.
Utah State University, UT 84233
(801) 750-2434

Degree: Ph.D., Statistics, 1975
Specialty: Statistics
Assigned: RADC

Dr. Patricia A. Carlson
Professor/Director
Dept. of Humanities
Rose-Hulman Inst. of Technology
5500 Wabash Avenue
Terre Haute, IN 47803
(812) 877-1511

Degree: Ph.D., Literature/Language, 1973
Specialty: Literature/Language
Assigned: HRL/LR

Dr. Kwo-Sun Chu
Chairman
Dept. of Physics & Comput. Sci.
Talladega College
Talladega, AL 35160
(205) 362-0206

Degree: Ph.D., Theoretical Physics, 1974
Specialty: Theoretical Physics
Assigned: ML

Dr. David Y. Chung
Professor
Dept. of Physics
Howard University
Washington, DC 20059
(202) 636-7903

Degree: Ph.D., Physics, 1966
Specialty: Theoretical Physics
Assigned: FJSRL

Dr. Robert W. Courter
Associate Professor
Dept. of Mechanical Engineering
Louisiana State University
CEBA 2513D
Baton Rouge, LA 70803
(504) 388-5891

Degree: Ph.D., Aerospace Eng., 1965
Specialty: Aerospace Engineering
Assigned: AD

Dr. Bruce A. Craver Associate Professor Dept. of Physics University of Dayton 300 College Park Dayton, OH 45469 (513) 229-2219	Degree: Specialty: Assigned:	Ph.D., Physics, 1976 Physics ML
Prof. William K. Curry Assistant Professor Dept. of Computer Science Rose-Hulman Inst. of Technology 5500 Wabash Ave. Terre Haute, IN 47803 (812) 877-1511	Degree: Specialty: Assigned:	M.S., Computer Sci., 1976 Computer Science AL
Dr. Phanindramohan Das Professor Dept. of Meteorology Texas A&M University College Station, TX 77843 (409) 845-0633	Degree: Specialty: Assigned:	Ph.D., Meteorology, 1963 Meteorology ESD
Dr. Bruce A. DeVantier Assistant Professor Dept. of Civil Eng. & Mechanics S. Illinois University Carbondale, IL 62901 (618) 536-2368	Degree: Specialty: Assigned:	Ph.D., Civil Eng., 1983 Civil Engineering ML
Dr. Elvis E. Deal Assistant Professor Dept. of Industrial Engineering University of Houston 4800 Calhoun Houston, TX 77004 (713) 749-4487	Degree: Specialty: Assigned:	Ph.D., Industrial Eng., 1985 Industrial Engineering OEHL
Dr. Suhrit K. Dey Professor Dept. of Mathematics Eastern Illinois University Charleston, IL 61920 (217) 581-3217	Degree: Specialty: Assigned:	Ph.D., Aerospace Eng., 1970 Aerospace Engineering AEDC

Dr. Ronna E. Dillon Professor Depts. of Educational Psychology and Psychology Southern Illinois University Carbondale, IL 62901 (618) 536-7763	Degree: Specialty: Assigned:	Ph.D., Educational Psychology, 1978 Educational Psychology HRL/MO
Dr. Ravinder Diwan Professor Dept. of Mechanical Engineering Southern University Baton Rouge, LA 70813 (504) 771-4701	Degree: Specialty Assigned:	Ph.D., Metallurgy, 1973 Metallurgy ML
Dr. Verlynda S. Dobbs Assistant Professor Dept. of Computer Science Wright State University 414 Fawcett Dayton, OH 45435 (513) 873-2491	Degree: Specialty: Assigned:	Ph.D., Computer Sci., 1985 Computer Science AL
Dr. F. Carroll Dougherty Assistant Professor Dept. of Aerospace Engineering University of Colorado Campus Box 429 Boulder, CO 80309 (303) 492-8464	Degree: Specialty: Assigned:	Ph.D., Aeronautical/Astronautical Engr., 1985 Aerospace Engineering AEDC
Dr. John M. Dunn Assistant Professor Dept. of Elec. & Compt. Eng. University of Colorado Campus Box 425 Boulder, CO 80309 (303) 492-5487	Degree: Specialty: Assigned:	Ph.D., Applied Physics, 1984 Applied Physics RADC
Dr. Thomas A.W. Dwyer Associate Professor Dept. of Aero & Astro Eng. University of Illinois 104 S. Mathews Avenue Urbana, IL 61801 (217) 244-0720	Degree: Specialty: Assigned:	Ph.D., Mathematics, 1971 Mathematics WL

Dr. Kiah Edwards Professor Dept. of Biology Texas Southern University 3100 Cleburne Street Houston, TX 77004 (713) 527-7829	Degree: Specialty: Assigned:	Ph.D., Molecular Biology, 1974 Molecular Biology OEHL
Dr. Marco A. Egoavil Associate Professor Dept. of Mechanical Engineering University of Puerto Rico Mayaguez, PR 00709 (809) 834-4040	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1981 Mechanical Engineering AEDC
Dr. Ira Elder Professor Dept. of Mathematical Sciences Eastern New Mexico University Portales, NM 88130 (505) 356-6208	Degree: Specialty: Assigned:	Ph.D., Applied Mathematics 1979 Applied Mathematics WL
Dr. Ramez Elmasri Assistant Professor Dept. of Computer Science Univ. of Houston Houston, TX 77036 (713) 749-2630	Degree: Specialty: Assigned:	Ph.D., Computer Science, 1980 Computer Science RADC
Dr. John E. Erdei Assistant Professor Dept. of Physics University of Dayton Dayton, OH 45469 (513) 229-2318	Degree: Specialty: Assigned:	Ph.D., Condensed Matter, 1983 Physics APL
Dr. Joseph J. Feeley Associate Professor Dept. of Electrical Engineering University of Idaho Moscow, ID 83843 (208) 885-7482	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1980 Electrical Engineering AD

Dr. Wilton Flemon Associate Professor Dept. of Chemistry Metropolitan State College Denver, CO 80204 (303) 556-2838	Degree: Specialty: Assigned:	Ph.D., Physical Organic Chemistry, 1970 Physical Organic Chemistry RPL
Dr. Dennis R. Flentge Associate Professor Dept. of Math/Science Cedarville College Box 601 Cedarville, OH 45314-0601 (513) 766-2211	Degree: Specialty: Assigned:	Ph.D., Physical Chemistry, 1974 Physical Chemistry APL
Dr. Luther D. Flippen, Jr. Assistant Professor Dept. of Mechanical and Nuclear Engineering Mississippi State University P O Drawer ME Mississippi State, MS 39759 (601) 325-3412	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1982 Mechanical Engineering RPL
Dr. Lee A. Flippin Assistant Professor Dept. of Chemistry San Francisco State Univ. San Francisco, CA 94132 (415) 469-1627	Degree: Specialty: Assigned:	Ph.D., Organic Chemistry, 1980 Organic Chemistry AFGL
Dr. Lionel R. Friedman Professor Dept. of Electrical Eng. Worcester Polytechnic Inst. 100 Institute Road Worcester, MA 01609 (415) 469-1627	Degree: Specialty: Assigned:	Ph.D., Physics, 1961 Physics RADC
Dr. John W. Gilmer Assistant Professor Polymer Science Program Penn State University University Park, PA 16802 (814) 863-1487	Degree: Specialty: Assigned:	Ph.D., Physical Chemistry, 1984 Physical Chemistry ML

Dr. Stephen J. Gold Associate Professor Dept. of Electrical Engineering South Dakota State University P O Box 2220 Brookings, SD 57007 (605) 688-4419	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1969 Electrical Engineering FJSRL
Dr. Michael R. Gorman Assistant Professor Dept. of Engineering Mechanics Univ. of Lincoln-Nebraska 216 Bancroft Hall Lincoln, NE 68588-0347 (402) 472-2397	Degree: Specialty: Assigned:	Ph.D., Physics, 1981 Physics RPL
Dr. Benjamin Gottlieb Professor Dept. of Science Bishop College 3837 Simpson Stuart Road Dallas, TX 75042 (214) 372-8773	Degree: Specialty: Assigned:	Ph.D., Physics, 1964 Physics AFGL
Dr. Gary M. Graham Assistant Professor Dept. of Mechanical Engineering Ohio University 261 Stocker Athens, OH 45701 (614) 593-1556	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1985 Mechanical Engineering FDL
Mr. William M. Grissom Assistant Professor Dept. of Physics Morehouse College 630 Westview Dr., S.W. Atlanta, GA 30314 (404) 681-2800	Degree: Specialty: Assigned:	M.S., Mechanical Eng., 1978 Mechanical Engineering AEDC
Dr. Timothy A. Grogan Assistant Professor Dept. of Electrical and Computer Engineering University of Cincinnati ML#30 898 Rhodes Hall Cincinnati, OH 45245 (513) 475-2349	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1983 Electrical Engineering RADC

Dr. Vijay K. Gupta Professor Dept. of Chemistry Central State University Wilberforce, OH 45384 (513) 376-6423	Degree: Specialty: Assigned:	Ph.D., Chemistry, 1969 Chemistry ML
Dr. Narayan C. Halder Professor Dept. of Physics University of South Florida Tampa, FL 33620 (813) 974-2781	Degree: Specialty: Assigned:	Ph.D., Physics, 1963 Physics AL
Dr. Kenneth R. Halliday Associate Professor Dept. of Mechanical Engineering Ohio University 259 Stocker Center Athens, OH 45701 (614) 593-1557	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng, 1977 Mechanical Engineering ML
Dr. Elmer C. Hansen Assistant Professor Dept. of Mechanical Engineering University of Florida 222 MEB Gainesville, FL 32611 (904) 392-0827	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1978 Mechanical Engineering AD
Dr. David Hart Assistant Professor Dept. of Mathematics University of Cincinnati Cincinnati, OH 45221 (513) 475-4851	Degree: Specialty: Assigned:	Ph.D., Mathematics, 1980 Mathematics FDL
Dr. Terence Hines Assistant Professor Dept. of Psychology Pace University Pleasantville, NY 10570 (914) 741-3791	Degree: Specialty: Assigned:	Ph.D., Psychology, 1978 Psychology HRL/OT

Dr. Albert Hirschberg Professor Dept. of Chemistry Long Island University Brooklyn, NY 11201 (516) 536-5719	Degree: Ph.D., Organic Chemistry, 1960 Specialty: Organic Chemistry Assigned: FJSRL
Dr. Robert Hoffman Associate Professor Dept. of Psychology Adelphi Univ. Garden City, NY 11530 (516) 663-1055	Degree: Ph.D., Psychology, 1978 Specialty: Psychology Assigned: AFGL
Dr. James Hoffmaster Chairman Dept. of Physics Gonzaga University Spokane, WA 99205 (509) 328-2416	Degree: Ph.D., Physics, 1970 Specialty: Physics Assigned: AD
Dr. Gwendolyn Howze Associate Professor Dept. of Biology Texas Southern University Houston, TX 77054 (713) 795-0280	Degree: Ph.D., Molecular Biology, 1974 Specialty: Physics Assigned: AD
Dr. Mayer Humi Associate Professor Dept. of Math WPI Worcester, MA 01609 (617) 755-3777	Degree: Ph.D., Applied Math, 1970 Specialty: Applied Mathematics Assigned: AFGL
Dr. Peter Jeffers Professor Dept. of Chemistry S.U.N.Y. Cortland, NY 13045 (607) 753-2903	Degree: Ph.D., Chemistry, 1964 Specialty: Chemistry Assigned: ESC
Dr. Gordon Johnson Professor Dept. of Physics Walla Walla College College Place, WA 99324 (509) 527-2881	Degree: Ph.D., Electrical Eng., 1972 Specialty: Electrical Engineering Assigned: ML

Dr. Louis Johnson Associate Professor Dept. of Electrical Engineering Oklahoma State Univ. Tryon, OK 74875 (918) 375-2374	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Electrical Eng., 1973 Electrical Engineering RADC
Dr. William Jordon Assistant Professor Dept. of Engineering Louisiana Tech. Univ. Ruston, LA 71272 (318) 257-4304	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Interdis. Eng., 1985 Engineering ML
Dr. William Kauder Assistant Professor Dept. of Accounting North Carolina A&T State Univ. Greensboro, NC 27411 (919) 294-4539	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Accounting, 1982 Business Administration LMC
Dr. John Kenney Assistant Professor Dept. of Physical Sciences Eastern New Mexico University Portales, NM 88130 (505) 562-2152	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Physical Chemistry, 1979 Physical Chemistry RPL
Dr. Yong Kim Assistant Professor Dept. of Civil Engineering Catholic University of America Washington, D.C. 20904 (301) 635-5164	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Civil Eng., 1984 Civil Engineering ESC
Dr. Charles Kimble Associate Professor Dept. of Psychology University of Dayton Dayton, OH 45469 (513) 229-2168	<u>Degree</u>: <u>Specialty</u>: <u>Assigned</u>:	Ph.D., Psychology, 1972 Psychology AAMRL

Dr. Jerome Knopp Associate Professor Dept. of Engineering University of Missouri Independence, MO 64050-1799 (913) 276-1278	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1976 Electrical Engineering WL
Dr. Lawrence Koons Professor Dept. of Chemistry Tuskegee University Tuskegee, AL 36088 (205) 727-8835	Degree: Specialty: Assigned:	Ph.D., Chemistry, 1956 Chemistry FJSRL
Dr. Henry Kurtz Assistant Professor Dept. of Chemistry Memphis State Univ. Memphis, TN 38107 (901) 454-2630	Degree: Specialty: Assigned:	Ph.D., Chemistry, 1977 Chemistry FJSRL
Dr. Thomas Lalk Assistant Professor Dept. of Mechanical Eng. Texas A&M Univ. College Station, TX 77840 (409) 693-9495	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1972 Mechanical Engineering APL
Dr. Dan Landis Professor Dept. of Psychology Univ. of Mississippi University, MS 38677 (601) 236-2441	Degree: Specialty: Assigned:	Ph.D., Psychology, 1963 Psychology DEOMI
Dr. Steven Leon Professor Dept. of Mathematics Southeastern Massachusettes North Dartmouth, MA 02747 (617) 999-8320	Degree: Specialty: Assigned:	Ph.D., Mathematics, 1971 Mathematics AFGL

Dr. David Ludwig Assistant Professor Dept. of Mathematics Univ. of North Carolina Greensboro, NC 27412-5001 (919) 334-5749	Degree: Ph.D., Mathematics, 1971 Specialty: Mathematics Assigned: SAM
Dr. Mohammed Maleque Associate Professor Dept. of Pharmacology Meharry Medical College Nashville, TN 37208 (615) 327-6510	Degree: Ph.D., Pharmacology, 1976 Specialty: Pharmacology Assigned: SAM
Dr. Robert Masingale Professor Dept. of Sciences and Math Jarvis Christian College Hawkins, TX 75765 (214) 769-2174	Degree: Ph.D., Chemistry, 1966 Specialty: Chemistry Assigned: FJSRL
Dr. Michael Matthews Assistant Professor Dept. of Behavioral Sciences Drury College Springfield, MO 65802 (417) 865-8731	Degree: Ph.D., Psychology, 1984 Specialty: Psychology Assigned: HRL/MO
Dr. Alastair McAulay Professor Dept. of Electrical Engineering Wright State University Dayton, OH 45440 (513) 873-2167	Degree: Ph.D., Electrical Eng., 1974 Specialty: Electrical Engineering Assigned: AL
Dr. Barry McConnell Assistant Professor Dept. of Computer & Info Sci. Florida A&M University Tallahassee, FL 32307 (904) 599-3022	Degree: Ph.D., Computer Sci., 1984 Specialty: Computer Science Assigned: WL
Mr. Oliver McGee Sr. Research Associate Dept. of Civil Engineering Ohio State University Gahanna, OH 43230 (614) 476-5035	Degree: M.S., Eng. Mechanics, 1983 Specialty: Engineering Mechanics Assigned: FDL

Dr. Daniel Mihalko Associate Professor Dept. of Math & Statistics Western Michigan University Kalamazoo, MI 49008 (616) 383-6165	Degree: Specialty: Assigned:	Ph.D., Math Statistics, 1977 Math Statistics SAM
Mr. Augustus Morris Mathematics Instructor Dept. of Natural Sciences Wilberforce University Wilberforce, OH 45426 (513) 376-2911	Degree: Specialty: Assigned:	B.S., Biomedical Eng., 1981 Biomedical Engineering AAMRL
Dr. Mary Morton-Gibson Associate Professor Dept. of Chemistry/Physics Lock Haven University Lock Haven, PA 17745 (717) 893-2054	Degree: Specialty: Assigned:	Ph.D., Physiology, 1970 Physiology/Biophysics SAM
Dr. Lena Myers Professor Dept. of Sociology/Social Psych. Jackson State University Jackson, MS 39217 (601) 968-2591	Degree: Specialty: Assigned:	Ph.D., Sociology, 1973 Sociology DEOMI
Dr. James Nail Associate Professor Dept. of Engineering Mississippi State Univ. Mississippi State, MS 39762 (601) 325-3665	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1976 Electrical Engineering AD
Dr. Henry Nebel Associate Professor Dept. of Physics Alfred University Alfred, NY 14802 (607) 871-2208	Degree: Specialty: Assigned:	Ph.D., Physics, 1967 Physics AFGL
Dr. Maurice Neveu Associate Professor Dept. of Chemistry State University College Fredonia, NY 14063 (716) 673-3285	Degree: Specialty: Assigned:	Ph.D., Chemistry, 1959 Physical/Organic Chemistry FJSRL

Dr. James Noyes Associate Professor Dept. of Math & C.S. Wittenberg University Springfield, OH 45501 (716) 673-3285	Degree: Specialty: Assigned:	Ph.D., Computer Sci., 1977 Computer Science AL
Dr. Noel Nussbaum Associate Professor Dept. of Biology Wright State University Dayton, OH 45401-0927 (513) 426-8935	Degree: Specialty: Assigned:	Ph.D., Biology, 1964 Biology AAMRL
Dr. Thomas Nygren Associate Professor Dept. of Psychology Ohio State University Columbus, OH 43221 (614) 486-7931	Degree: Specialty: Assigned:	Ph.D., Psychology, 1975 Psychology AAMRL
Dr. Kurt Oughstun Assistant Professor Dept. of Electrical/Computer Engineering University of Wisconsin Madison, WI 53705 (608) 231-3126	Degree: Specialty: Assigned:	Ph.D., Optics, 1979 Optical Sciences SAM
Dr. Surgounda Patil Professor Dept. of Math Tennessee Technical University Cookeville, TN 38501 (615) 528-6924	Degree: Specialty: Assigned:	Ph.D., Math Stat., 1966 Math Statistics AEDC
Dr. Martin Patt Associate Professor Dept. of Electrical Engineering University of Lowell Lowell, MA 01854 (617) 452-5000	Degree: Specialty: Assigned:	M.S., Electrical Eng., 1964 Electrical Engineering AFGL
Dr. William Patten Assistant Professor Dept. of Mechanical Eng. University of Iowa Iowa City, IA 52242 (319) 335-5675	Degree: Specialty: Assigned:	Ph.D., Mechanical Eng., 1986 Mechanical Engineering FDL

Dr. Ralph Peters Associate Professor Dept. of Biology Wichita State University Wichita, KS 67217 (316) 943-8762	Degree: Specialty: Assigned:	Ph.D., Zoophysiology, 1975 Zoology SAM
Dr. Randall Peters Associate Professor Dept. of Physics Texas Tech University Lubbock, TX 79409 (806) 742-3757	Degree: Specialty: Assigned:	Ph.D., Physics, 1968 Physics WL
Dr. Gerald Pollack Professor Dept. of Physics/Astronomy Michigan State University East Lansing, MI 48823 (517) 353-9590	Degree: Specialty: Assigned:	Ph.D., Physics, 1968 Physics SAM
Dr. Spencer Porter Professor Dept. of Chemistry Capital Univeristy Columbus, OH 43209 (614) 236-6107	Degree: Specialty: Assigned:	Ph.D., Phys. Chemistry, 1968 Physcial Chemistry ML
Dr. Leonard Price Chairman Dept. of Chemistry Xavier Univ. of Louisiana New Orleans, LA 77012 (504) 486-7411	Degree: Specialty: Assigned:	Ph.D., Org. Chemistry, 1962 Organic Chemistry SAM
Dr. Stephen Pruett Assistant Professor Dept. of Biological Sciences Mississippi State University Mississippi, MS 39762 (601) 325-3120	Degree: Specialty: Assigned:	Ph.D., Immunology, 1980 Immunology SAM
Dr. Panapkkam Ramamoorthy Associate Professor Dept. of Electrical/Computer Eng. University of Cincinnati Cincinnati, OH 45221 (513) 475-4247	Degree: Specialty: Assigned:	Ph.D., Digital Signal Process, 1977 Electrical Engineering RADC

Dr. Gandikota Rao Professor Dept. of Meterology St. Louis University St. Louis, MO 63156 (314) 658-3115	Degree: Ph.D., Meteorology, 1965 Specialty: Meteorology Assigned: AFGL
Dr. Donald Robertson Associate Professor Dept. of Psychology Indiana University of PA Indiana, PA 15705 (412) 357-4522	Degree: Ph.D., Psychology, 1981 Specialty: Psychology Assigned: AAMRL
Dr. Kenneth Roenker Associate Professor Dept. of Electrical/Computer Eng. University of Cincinnati Cincinnati, OH 45221 (513) 475-4461	Degree: Ph.D., Solid State Physics, 1973 Specialty: Solid State Physics Assigned: AL
Dr. Ramendra Roy Professor Dept. of Nuclear Engineering Arizona State University Mesa, AZ 85202 (602) 838-0551	Degree: Ph.D., Nuclear Engr., 1975 Specialty: Nuclear Engineering Assigned: APL
Dr. Paul Rybski Assistant Professor Dept. of Physics University of Wisconsin Whitewater, WI 53190-1790 (414) 472-5766	Degree: Ph.D., Astronomy, 1972 Specialty: Astronomy Assigned: AFGL
Dr. Joseph Saliba Assistant Professor Dept. of Civil Engineering University of Dayton Dayton, OH 45469 (513) 229-3847	Degree: Ph.D., Solid Mechanics, 1983 Specialty: Solid Mechanics Assigned: FDL
Dr. Richard Schori Professor Dept. of Mathematics Oregon State University Corvallis, OR 97333 (503) 754-4686	Degree: Ph.D., Mathematics, 1964 Specialty: Mathematics Assigned: SAM

Dr. Lawrence Schovanec Assistant Professor Dept. of Mathematics Texas Tech University Lubbock, TX 79409 (806) 742-1424	Degree: Specialty: Assigned:	Ph.D., Mathematics, 1964 Mathematics RPL
Dr. William Schulz Associate Professor Dept. of Chemistry Eastern Kentucky University Richmond, KY 40475 (606) 622-1463	Degree: Specialty: Assigned:	Ph.D., Chemistry, 1975 Chemistry ESC
Dr. Nisar Shaikh Assistant Professor Dept. of Engr. Mechanics Univ. of Nebraska Lincoln, NE 68588-1347 (402) 472-2384	Degree: Specialty: Assigned:	Ph.D., Mechanics, 1983 Mechanics ML
Dr. Shiva Singh Professor Dept. of Mech. Engineering Univ. of Kentucky Lexington, KY 40506 (606) 257-3825	Degree: Specialty: Assigned:	Ph.D., Mathematics, 1959 Mathematics FDL
Dr. Gary Slater Professor Dept. of Aerospace Engineering University of Cincinnati Cincinnati, OH 45221 (513) 475-6287	Degree: Specialty: Assigned:	Ph.D., Aerospace Engr., 1971 Aerospace Engineering FDL
Dr. Timothy Su Professor Dept. of Physical Chemistry Southeastern Massachusetts Univ. North Dartmouth, MA 02790 (617) 999-8235	Degree: Specialty: Assigned:	Ph.D., Physical Chem., 1971 Physical Chemistry AFGL
Dr. David Sumberg Associate Professor Dept. of Electrical Engr. Rochester Institute of Tech. Rochester, NY 14618 (716) 475-6067	Degree Specialty: Assigned:	Ph.D., Physics, 1972 Physics RADC

Dr. Wesley Tanaka Associate Professor Dept. of Chemistry University of Wisconsin Eau Claire, WI 54701 (715) 836-5388	Degree: Specialty: Assigned:	Ph.D., Biochemistry, 1974 Biochemistry SAM
Dr. Richard Tankin Professor Dept. of Mechanical Engr. Northwestern University Evanston, IL 60201 (312) 491-3532	Degree Specialty: Assigned:	Ph.D., Mechanical Eng., 1960 Mechanical Engineering APL
Dr. Joseph Tedesco Assistant Professor Dept. of Civil Engineering Auburn University Auburn, AL 36849 (205) 826-4320	Degree Specialty: Assigned:	Ph.D., Civil Engr., 1982 Civil Engineering ESC
Dr. Forrest Thomas Professor Dept. of Chemistry University of Montana Missoula, MT 59812 (406) 549-8205	Degree Specialty: Assigned:	Ph.D., Chemistry, 1959 Chemistry FDL
Dr. Howard Thompson Professor Dept. of Mechanical Engineering Purdue University W. Lafayette, IN 47907 (317) 494-5624	Degree Specialty: Assigned:	Ph.D., Mech. Engr., 1965 Mechanical Engineering FJSRL
Dr. David Townsend Associate Professor Dept. of Psychology Montclair State College Upper Montclair, NJ 07043 (201) 783-9407	Degree Specialty: Assigned:	Ph.D., Cog. Psychology, 1972 Cognitive Psychology HRL/LR
Dr. Michele Trankina Assistant Professor Dept. of Biology St. Mary's University San Antonio, TX 78284 (512) 436-3241	Degree Specialty: Assigned:	Ph.D., Nutrit. Physiology 1982 Nutritional Physiology SAM

Dr. Robert Trenary Assistant Professor Dept. of Computer Sci. & Math Western Michigan University Kalamazoo, MI 49008 (616) 383-6151	Degree Specialty: Assigned:	Ph.D., Computer Science/Math 1987 Computer Science AL
Dr. Dennis Truax Assistant Professor Civil Engineering Dept. of Civil Engineering Mississippi State Univeristy Mississippi State, MS 39762 (601) 325-3050	Degree Specialty: Assigned:	Ph.D., Civil Eng., 1986 Civil Engineering ESC
Dr. John Uhlarik Professor Dept. of Psychology Kansas State University Manhattan, KS 66506 (913) 532-6850	Degree Specialty: Assigned:	Ph.D., Psychology, 1970 Psychology HRL/OT
Dr. P. Vaidya Associate Professor Dept. of Mechanical Engineering Washington State Univ. Pullman, WA 99164 (509) 335-7436	Degree Specialty: Assigned:	Ph.D., Acoustics, 1969 Acoustics ESC
Dr. Joseph Verducci Assistant Professor Dept. of Statistics Ohio State University Columbus, OH 43210 (614) 292-3886	Degree: Specialty: Assigned:	Ph.D., Statistics, 1982 Statistics OEHL
Dr. Robert Voigt Associate Professor Metallurgy Dept. of Mechanical Engr. University of Kansas Lawrence, KS 66045 (913) 864-3181	Degree: Specialty: Assigned:	Ph.D., Metallurgical Engr., 1981 Metallurgical Engineering ML

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(1987) PROGRAM MA (U) UNIVERSAL ENERGY SYSTEMS INC
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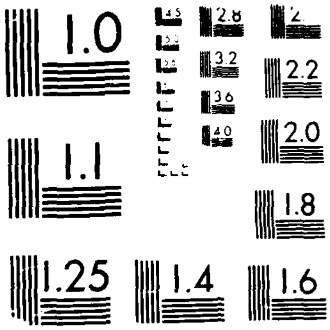

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NATIONAL BUREAU OF STANDARDS-1963-A

Dr. Keith Walker
Professor
Dept. of Physics
Point Loma College
San Diego, CA 92106
(619) 221-2374

Degree: Ph.D., Physics, 1971
Specialty: Physics
Assigned: AFGL

Dr. Richard Walker
Assistant Professor
Dept. of Mathematics
Fort Lewis College
Durango, CO 81302
(303) 247-7147

Degree: Ph.D., Math/Geophysics, 1979
Specialty: Mathematics
Assigned: AFGL

Dr. Jacob Weinberg
Professor
Dept. of Mathematics
University of Lowell
Lowell, MA 01854
(617) 727-9820

Degree: Ph.D., Mathematics, 1961
Specialty: Mathematics
Assigned: RADC

Dr. Howard Weiss
Associate Professor
Dept. of Management
Temple University
Philadelphia, PA 19122
(215) 787-6829

Degree: Ph.D., Industrial Eng., 1975
Specialty: Industrial Engineering
Assigned: LC

Dr. Charles Wells
Associate Professor
Dept. of Decision Sciences
University of Dayton
Dayton, OH 45469
(513) 229-3332

Degree: Ph.D., Management Sci., 1982
Specialty: Management Science
Assigned: HRL/LR

Dr. Ward Wells
Assistant Professor
Human Performance
Dept. of Physical Education
University of Alaska
Fairbanks, AL 99775-0240
(907) 479-5115

Degree: Ph.D., Human Performance, 1981
Specialty: Human Performance
Assigned: SAM

Dr. John Westerkamp
Assistant Professor
Dept. of Electrical Engr.
University of Dayton
Dayton, OH 45469
(513) 229-3611

Degree: Ph.D., Electrical Eng., 1985
Specialty: Electrical Engineering
Assigned: AAMRL

Dr. Robert Wetherhold Assistant Professor Mechanical & Aerospace Eng. State Univiversity of New York Buffalo, NY 14260 (716) 636-2593	Degree: Specialty: Assigned:	Ph.D., Applied Science, 1983 High Temperature Composite Materials ML
Dr. William Wheless Assistant Professor Dept. of ECE New Mexico State University Las Cruces, NM 88003 (505) 646-3214	Degree: Specialty: Assigned:	Ph.D., Electrical Eng., 1985 Electrical Engineering WL
Dr. Stanley Whidden Researcher Hyperbaric Medicine Dept. of Hyperbaric Medicine JESM Baromedical Research Inst. New Orleans, LA 70115 (504) 363-7656	Degree: Specialty: Assigned:	M.D., Hyperbaric Medicine, 1984 Hyperbaric Medicine SAM
Dr. Andrew Whipple Associate Professor Dept. of Biology Taylor University Upland, IN 46989 (317) 998-5333	Degree: Specialty: Assigned:	Ph.D., Cell Biology, 1979 Cell Biology AAMRL
Dr. Sharon Williams Instructor Dept. of Chemistry Southern University Baton Rouge, LA 70813-0572 (504) 771-3990	Degree: Specialty: Assigned:	M.S., Cell Biology, 1979 Biochemistry SAM
Dr. Frank Witzmann Assistant Professor Dept. of Biology IUPUI Columbus Columbus, OH 47203 (614) 372-8266	Degree: Specialty: Assigned:	Ph.D., Biology, 1981 Biology AAMRL

Dr. William Wolfe Associate Professor Dept. of Civil Engineering Ohio State University Columbus, OH 43210 (614) 292-0790	Degree: Ph.D., Engineering, 1979 Specialty: Engineering Assigned: FDL
Dr. Lawrence Wolpert Associate Professor Dept. of Psychology Ohio State University Columbus, OH 43210 (614) 267-9328	Degree: M.S., Psychology, 1983 Specialty: Psychology Assigned: AAMRL
Dr. Cheng-Hsiao Wu Associate Professor Solid State Physics Dept. of Electrical Eng. Univ. of Missouri Rolla, MO 65401 (314) 341-4677	Degree: Ph.D., Solid State Physics, 1972 Specialty: Solid State Physics Assigned: APL
Dr. Joan Wyzkoski Associate Professor Dept. of Math & Computer Sci. Fairfield University Fairfield, CT 06430-7524 (203) 254-4000	Degree: Ph.D., Mathematics, 1979 Specialty: Mathematics Assigned: WL
Dr. Melvin Zandler Associate Professor Physical Chemistry Dept. of Chemistry Wichita State Univ. Wichita, KS 67204 (316) 689-3120	Degree: Ph.D., Physical Chemistry, 1966 Specialty: Physical Chemistry Assigned: FJSRL
Dr. George Zobrist Professor Dept. of Computer Science University of Missouri Rolla, MO 65401 (314) 341-4492	Degree: Ph.D., Electrical Eng., 1965 Specialty: Electrical Engineering Assigned: ESMC

APPENDIX II C

PARTICIPANT LABORATORY ASSIGNMENT

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 1)

1987 USAF/UES SUMMER FACULTY RESEARCH PROGRAM

AERO PROPULSION LABORATORY (AFWAL/APL)
(Wright-Patterson Air Force Base)

1. Suresh Aggarwal
2. Bryan Becker
3. John Erdei
4. Dennis Flentge
5. Thomas Lalk
6. Ramendra Roy
7. Richard Tankin
8. Cheng-Hsiao Wu

ARMAMENT LABORATORY (AD)
(Eglin Air Force Base)

1. Charles Bell
2. David Betounes
3. John Bppp, Jr.
4. Robert Buchl
5. Robert Courter
6. Joseph Feeley
7. Elmer Hansen
8. James Hoffmaster
9. James Nail

ARMSTRONG AEROSPACE MEDICAL RESEARCH LABORATORY (AAMRL)
(Wright-Patterson Air Force Base)

1. Xavier Avula
2. Praphulla Bajpai
3. Shankar Bale
4. Gwendolyn Howze
5. Charles Kimble
6. Augustus Morris
7. Noel Nussbaum
8. Thomas Nygren
9. Donald Robertson
10. John Westerkamp
11. Andrew Whipple
12. Frank Witzmann
13. Lawrence Wolpert

ARNOLD ENGINEERING DEVELOPMENT CENTER (AEDC)
(Arnold Air Force Station)

1. Lee Britt
2. Suhrit Dey
3. Carroll Dougherty
4. Marco Egoavil
5. William Grissom
6. Surgounda Patil

AVIONICS LABORATORY (AFWAL/AL)
(Wright-Patterson Air Force Base)

1. John Amoss
2. Vernon Bakke
3. William Curry
4. Verlynda Dobbs
5. Narayan Halder
6. Alastair McAulay
7. James Noyes
8. Kenneth Roenker
9. Robert Trenary

DEFENSE EQUAL OPPORTUNITY MANAGEMENT INSTITUTE (DEOMI)
(Patrick Air Force Base)

1. Dan Landis
2. Lena Myers

EASTERN SPACE AND MISSILE CENTER (ESMC)
(Patrick Air Force Base)

1. George Zobrist

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 2)

ELECTRONICS SYSTEMS DIVISION (ESD)
(Hanscom Air Force Base)
1. Phanindramoha Das

ENGINEERING AND SERVICES CENTER (ESC)
(Tyndall Air Force Base)
1. William Bannister
2. William Bass
3. Peter Jeffers
4. Yong Kim
5. William Schulz
6. Joseph Tedesco
7. Dennis Truax
8. P. G. Vaidya

FLIGHT DYNAMICS LABORATORY (AFWAL/FDL)
(Wright-Patterson Air Force Base)
1. Gary Graham
2. David Hart
3. Oliver McGee
4. William Patten
5. Joseph Saliba
6. Shiva Singh
7. Gary Slater
8. Forrest Thomas
9. William Wolfe

FRANK J. SEILER RESEARCH LABORATORY (FJSRL)
(USAF Academy)
1. Charles Bump
2. David Chung
3. Stephen Gold
4. Albert Hirschberg
5. Lawrence Koons
6. Henry Kurtz
7. Maurice Neveu
8. Howard Thompson
9. Melvin Zandler

GEOPHYSICS LABORATORY (AFGL)
(Hanscom Air Force Base)
1. Franceso Bacchialoni
2. Lee Flippin
3. Benjamin Gottlieb
4. Robert Hoffman
5. Mayer Humi
6. Steven Leon
7. Henry Nebel
8. Martin Pa.t
9. Gandikota Rao
10. Paul Rybski
11. Timothy Su
12. Keith Walker
13. Richard Walker

HUMAN RESOURCES LABORATORY/LR (HRL/LR)
(Wright-Patterson Air Force Base)
1. Patricia Carlson
2. David Townsend
3. Charles Wells

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 3)

HUMAN RESOURCES LABORATORY/MO (HRL/MO)
(Brooks Air Force Base)
1. Victor Appel
2. Ronna Dillon
3. Michael Matthews

HUMAN RESOURCES LABORATORY/OT (HRL/OT)
(Williams Air Force Base)
1. Terence Hines
2. John Uhlarik

LOGISTICS COMMAND (LC)
(Wright-Patterson Air Force Base)
1. Howard Weiss

LOGISTICS MANAGEMENT CENTER (LMC)
(Gunter Air Force Base)
1. Kweku Bentil
2. Jerome Blaylock
3. William Kauder

MATERIALS LABORATORY (AFWAL/ML)
(Wright-Patterson Air Force Base)
1. Kwo-Sun Chu
2. Bruce Craver
3. Bruce DeVantier
4. Ravinder Diwan
5. John Gilmer
6. Vijay Gupta
7. Kenneth Halliday
8. Gordon Johnson
9. William Jordan
10. Spencer Porter
11. Nisar Shaikh
12. Robert Voigt
13. Robert Wetherhold

OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)
(Brooks Air Force Base)
1. Richard Brown
2. Elvis Deal
3. Kiah Edwards
4. Robert Masingale
5. Joseph Verducci

ROCKET PROPULSION LABORATORY (RPL)
(Edwards Air Force Base)
1. Gurbux Alag
2. Allan Burkett
3. Wilton Flemon
4. Luther Flippen
5. Michael Gorman
6. John Kenney
7. Lawrence Schovanec

C. PARTICIPANT LABORATORY ASSIGNMENT (Page 4)

ROME AIR DEVELOPMENT CENTER (RADC)
(Griffiss Air Force Base)

1. Beryl Barber
2. Kevin Bowyer
3. Ronald Canfield
4. John Dunn
5. Ramez Elmasri
6. Lionel Friedman
7. Timothy Grogan
8. Louis Johnson
9. Panapakkam Ramamoorthy
10. David Sumberg
11. Jacob Weinberg

SCHOOL OF AEROSPACE MEDICINE (SAM)
(Brooks Air Force Base)

1. Phillip Bishop
2. David Ludwig
3. Mohammed Maleque
4. Daniel Mihalko
5. Mary Morton-Gibson
6. Kurt Oughstun
7. Ralph Peters
8. Gerald Pollack
9. Leonard Price
10. Stephen Pruett
11. Richard Schori
12. Wesley Tanaka
13. Michele Trankina
14. Ward Wells
15. Stanley Whidden
16. Sharon Williams

WEAPONS LABORATORY (WL)
(Kirtland Air Force Base)

1. Thomas Dwyer
2. Ira Elder
3. Jerome Knopp
4. Barry McConnell
5. Randall Peters
6. William Wheless
7. Joan Wyzkoski

APPENDIX III

A. Listing of Research Reports Submitted in the 1987 Summer Faculty Research Program

B. Abstracts of the 1987 Summer Fellow's Research Reports

APPENDIX III A

RESEARCH REPORTS

1987 SUMMER FACULTY RESEARCH PROGRAM

Technical Report Number	Title	Professor
Volume I		
1	Vaporization Behavior of Multicomponent Fuel Droplets in a Hot Air Stream	Dr. Suresh K. Aggerwal
2	Large Space Structure Parameter Estimation	Dr. Gurbux S. Alag
3	Correlation and Simulation Studies of GaAs Microwave MESFET Power Devices	Dr. John W. Amoss
4	Air Force Officer Selection Revisited: Entertaining The Possibilities for Improvement	Dr. Victor H. Appel
5	Evaluation of Three-Dimensional Kinetics Analysis Methods of Robotics for the Study of Human Articulated Motion	Dr. Xavier J.R. Avula
6	Pointing Control Systems for Balloon-Flown Instruments	Dr. Franceso Bacchialoni
7	Sustained Delivery of Volatile Chemicals by Means of Ceramics	Dr. Praphulla K. Bajpai
8	Frequency Estimation in the Analysis of Radar Signals	Dr. Vernon L. Bakke
9	Invitro Cytotoxic Effects of Perflurodecanoic Acid on L5178Y Mouse Lymphoma Cells	Dr. Shankar S. Bale
10	Fire Technology of Jet Fuels (JP-8 vs. JP-4)	Dr. William W. Bannister
11	Microwave Measurements	Prof. Beryl L. Barber
12	Identification Techniques Using Fragmentary Human Bone	Dr. William M. Bass
13	A Numerical Simulation of the Flow Field and Heat Transfer in a Rectangular Passage with a Turbulence Promoter	Dr. Bryan R. Becker

14	Synergistic Effects of Bomb Cratering	Dr. Charles Bell
15	Construction Contract Administrator's Technical Handbook	Prof. Kweku K. Bentil
16	Least Squares Estimation Theory and Geometrical Smoothers	Dr. David E. Betounes
17	Increasing Work Capacity of Personnel Wearing Protective Clothing in Hot Environments	Prof. Phillip A. Bishop
18	User-System Interface Standards	Dr. Jerome W. Blaylock
19	Fourier Transform Infrared Studies of Ethylenediammonium Dinitrate and 1,4-Butanediammonium Dinitrate	Dr. John M. Bopp, Jr.
20	A "Form and Function" Knowledge Representation for Reasoning about Classes and Instances of Objects	Dr. Kevin W. Bowyer
21	An Analysis of Infrared Light Propoga-tion in Hollow Metallic Light Pipes	Mr. Lee I. Britt
22	Phytotoxicity of Soil Residues of JP-4 Aviation Fuel	Mr. Richard. H. Brown
23	Dynamics of a Metallic Jet	Dr. Robert A. Buchl
24	Reactions of Nitryl Chloride with Aromatic Substrates in Chloraluminate Melts	Dr. Charles M. Bump
25	Chemistry for the Space Program	Dr. Allan R. Burkett
26	Bayesian Testability Demonstration	Dr. Ronald V. Canfield
27	Hypertext and the Integrated Maintenance Information System (IMIS)	Dr. Patricia Carlson
28	Dopant Diffusion in NIPI Semiconductor Superlattices	Dr. Kwo-Sun Chu
29	Nonlinear Optical Effects in Fibers and Small Crystals	Dr. David Y. Chung
30	The Effect of Model Flexibility on the Accuracy of Aerodynamic Coefficients Determined from Free-Flight Ballistic Tests	Dr. Robert W. Courter
31	Tunable Absorption in Superlattices	Dr. Bruce A. Craver

32	Computer Simulation of Adaptive Resource Management in Real-Time	Prof. William K. Curry
33	Effect of Wind and Turbulence on an Artificially Generated Strato-Mesopheric Plasma	Dr. Phanindramoha Das
34	Analysis and Modeling of the Thermal Response of an Autoclave for Expert System Control of Carbon-Epoxy Composite Fabrication	Dr. Bruce A. DeVantier
35	A Study of Service Demand Distribution and Task Organization fc. the Analysis of Environmental Samples and Associated Support Services at the USAF Occupational and Environmental Health Laboratory-Brooks AFB, San Antonio, Texas	Dr. Elvis Deal
36	Vectorized Perturbed Functional Iterative Scheme (VPFIS) for Numerical Solution of Nonlinear Partial Differential Equations	Dr. Suhrit K. Dey
37	An Eight-Domain Framework for Understanding Intelligence and Predicting Intelligent Performance	Dr. Ronna F. Dillon
38	Microstructural Developments in Titanium Aluminides: A Study of Dynamic Material Modeling Behavior	Dr. Ravinder Diwan
39	Ada and Artificial Intelligence Applications for Electronic Warfare	Dr. Verlynda S. Dobbs
40	Computational Simulation of Transonic Store Separation	Dr. F. Carroll Dougherty
41	Guided Waves in Millimeter Wave Circuit Design	Dr. John M. Dunn
42	Slew-Coupled Structural Dynamics Identification and Control	Dr. Thomas A.W. Dwyer
43	The Effects of Metal Mutagens on the Synthesis and Accumulation of Macromolecules	Dr. Kiah Edwards
44	Project 1 - Scaling Laws of Two-Dimension Nozzle Plumes; Project 2 - Design of a Mechanism to Control Turbulence Levels in Wind Tunnels	Dr. Marco A. Egoavil

63	The Surface Primitive Method of Feature Based Computer Aided Design for Manufacture	Dr. Kenneth R. Halliday
64	Gun Gas Diversion	Dr. Elmer C. Hansen
65	Multi-Block Grid Optimization	Dr. David Hart
66	Encoding in Less than 100 Milliseconds Demonstrated Using a Reaction Time Task	Dr. Terence M. Hines
67	Nitrated Heterocyclic Compounds: A Synthetic Study	Dr. Albert I. Hirschberg
68	A Human Factors Approach to the Process of Developing the Advanced Meteorological Processing System	Dr. Robert R. Hoffman
69	Pressure Attenuation in Solids: A Computer Model	Dr. James S. Hoffmaster
70	In Situ Detection of Osteoprogenitor Cells in an Actively Growing Bone System	Dr. Gwendolyn B. Howze
71	Non-local Turbulance Theories	Dr. Mayer Humi
72	Leaching and Hydrolysis of some Chlorinated Solvents	Dr. Peter M. Jeffers
73	Cholesteric Liquid Crystals of Biomolecules for Use as Optical Filters	Dr. Gordon O. Johnson
74	Contribution of the Value Assignment Problem to the Complexity of Test Generation in Combinational Logic Circuits and Power Line Testing of CMOS Digital Logic Circuits	Dr. Louis G. Johnson
75	Effect of Stacking Sequence Upon Delamination Fracture Toughness	Dr. William M. Jordan
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APPENDIX III B

ABSTRACTS

VAPORIZATION BEHAVIOR OF MULTICOMPONENT FUEL DROPLETS IN A HOT AIR STREAM

by

Suresh K. Aggarwal* and K. Nguyen**

Abstract

An experimental-theoretical investigation of the behavior of evaporating fuel droplets in an hot air flow was initiated. In the theoretical part, a computer code was developed to calculate the droplet size, velocity, and surface properties along its trajectories. The major features of the code are (i) three different liquid-phase models, namely the diffusion-limit, infinite-diffusion, and vortex, can be employed, (ii) Two gas-phase models used for the external convection effect on the transport rates are the Ranz-Marshall and the axisymmetric models, (iii) vaporization of pure as well as multicomponent fuel droplets can be predicted, and (iv) variable property effects are considered. A parametric study was completed, where the predictions of the three liquid-phase models were compared, and the variable-property effects were evaluated. From these results, the operating conditions for the experimental study were identified.

In the experimental part, the facility to inject a single stream of droplets in well-characterized hot air flow was set up. A LDV system and a thermocouple measure the local air properties. The droplet properties were measured by the Phase-Doppler particle analyzer and photography. Several tests were completed to fully characterize the experimental conditions. In future, the focus will be to compare the experimental and theoretical data for laminar flow conditions. The study would be then extended to turbulent flows. The future work is described in the Research Initiation Proposal.

* Assistant Professor
** Graduate Student

Large Space Structure Parameter Estimation

by

Gurbux S. Alag

ABSTRACT

There has been a great deal of interest in experimental modal analysis as a part of an integrated computer aided engineering approach to the solution of structural dynamics problems. Experimental modal analysis refers to the process of determining the modal parameters (frequencies, damping factors, and modal vectors) of a linear, time-invarient system by way of an experimental approach. One common reason for the experimental approach is the verification of the results of the analytical approach, such as finite element analysis.

The determination of modal parameters from experimentally measured data involves the use of *parameter estimation* techniques. The estimation methods are changing due to the transfer of existing technology from the other fields where estimation techniques have been more commonly used over the past several decades. It is proposed to investigate the practical implementation and use of various parameter estimation techniques to determine modal parameters from experimentally measured data.

Correlation and Simulation Studies of Microwave MESFET Power Devices

by

John W. Amoss

ABSTRACT

Correlation plots of dc data for microwave power MESFETs are presented. These data were measured on devices processed on substrates grown by low-pressure and high-pressure Czochralski techniques. The purpose of the correlation was to assess the merits of GaAs materials grown by the two methods and to establish the uniformity of ion implantation, annealing, and processing of full 3 inch diameter substrates. Since the characteristics of the devices seemed to be process and device related, correlation plots of measured data were compared with correlation plots of Monte-Carlo simulations to help identify what process or device parameters were causing the observed variations in dc characteristics.

Air Force Officer Selection Revisited: Entertaining The Possibilities for Improvement

by

Victor H. Appel

and

Andrew D. Carson

ABSTRACT

Research literature was examined to identify selection devices or methodological/conceptual developments appearing promising as a means for enhancing the system of officer selection for Officer Training School and Air Force ROTC candidates. In that the current system is focused almost exclusively on cognitive/intellective predictors, the investigators sought to broaden the scope by incorporating predictors of other likely sources of variance, particularly leadership/managerial and commitment variables. Recommendations are offered how such constructs might be tapped by incorporating an appropriate biodata form within the existing selection device, the AFOQT. Experimentation over the long run with an assessment center methodology is also proposed.

EVALUATION OF THREE-DIMENSIONAL KINEMATICS ANALYSIS METHODS OF ROBOTICS FOR THE STUDY OF HUMAN ARTICULATED MOTION

by

Xavier J. R. Avula

ABSTRACT

The three-dimensional kinematic analysis methods of robotics were considered for the study of human articulated motion. Literature on the direct and indirect kinematics analysis was reviewed for the purpose of evaluating the Articulated Total Body (ATB) Model at the Armstrong Aerospace Medical Research Laboratory as a simulation tool in the development of robotics telepresence technology. The behavior of the ATB right arm was simulated on the computer with a force applied to the center of the hand. The arm positions at various times, and the workspace were determined. Recommendations were made to develop software based on the three-dimensional kinematics methods for the ATB Model, and to perform reach analysis for determining workspace boundaries.

POINTING CONTROL SYSTEMS FOR BALLOON-FLOWN INSTRUMENTS

by

Francesco L. Bacchialoni

ABSTRACT

This report considers the motions of a balloon-borne payload and examines in a qualitative fashion the overall requirements of pointing systems for balloon-borne scientific experiments.

General purpose support platforms are considered, and two general configurations are recommended. One is simple, of moderate accuracy and cost, the other is more complex, more accurate and considerably more expensive.

Sustained Delivery of Volatile Chemicals

By Means of Ceramics

by

Praphulla K. Bajpai and Deborah E. Hollenbach

Abstract

A simple ceramic delivery system was developed for studying the toxicity of chemicals such as 1,1,1-trichloroethane (TCE) in animals. 1,1,1-trichloroethane was determined by gas chromatography. Use of glass tube inserts and Silicone® adhesive sealant for sealing the ceramic cavity provided the best results. Storing of TCE (45 mg) in glass tubes within the ceramic cavity allowed retention and delivery rate of TCE at 3595 ug/hr for eight hours *in vitro*. Reservoir modification of the glass tube-ceramic device to store 259 mg TCE, resulted in a sustained delivery rate of TCE (624 ug/hr) for 11 days *in vitro*. Analysis of hexane extracts of blood obtained from rats implanted with the glass tube-ceramic device containing 45 mg TCE, indicated that blood TCE was constant for 20 hours. Analysis of the chamber air housing a rat implanted with a similar device indicated that the level of TCE remained sustained at 1344 ug/hr for two hours. The data obtained in this investigation suggests that the ceramic system can be modified to deliver volatile chemicals in a sustained manner for studying the pharmacokinetics and toxicity of these solvents.

FREQUENCY ESTIMATION IN THE ANALYSIS OF RADAR SIGNALS

by

Vernon L. Bakke

ABSTRACT

A numerical algorithm for the estimation of frequencies in radar signals is presented. The algorithm is based on the autoregressive method and the Yule-Walker equations. The problem of determining the correct frequency modulus, which is associated with longer delay times is encountered, and an algorithm to resolve this ambiguity is presented. When multiple frequencies are present, the above problem complicates the algorithm and a scheme is developed to correctly pair the frequencies with their associated modulus.

Invitro Cytotoxic Effects of Perfluorodecanoic acid on L5178Y Mouse Lymphoma Cells

By

Shankar S. Bale

ABSTRACT

Cytotoxic effects of perfluorodecanoic acid on L5178Y cells were studied. Cells were exposed to 0ug, 1ug, 2ug, 8ug, 16ug, and 32ug/ml of perfluorodecanoic acid(PFDA) for 8,28,52, and 76 hours. PFDA induced cytotoxicity in all the concentrations used. Time and level response was observed in all the treatments. Cell lysis was significant at higher concentrations used. 80 to 100 percent cell death occured within twelve hours of treatment at higher levels of treatment.

FIRE TECHNOLOGY OF JET FUELS (JP-8 VS. JP-4)

William W. Bannister

Abstract

JP-4 and JP-8 are compared, regarding recently developed fire fighting techniques, and safety hazards in terms of refuelling, spills and leakages, controlled crash landings, in-flight gunfire effects, and running fuel fires. An anomalous relationship between fuel ignitability and volatility was discovered. Thus, flash points are well known to be inversely proportional to volatility, and high volatility (low flash point) fuels are thus regarded more flammable. In this work, however, high volatility fuels were shown to be less easily ignited by contact with hot metal surfaces. This may be important in fuel selection: high volatility JP-4 may actually be safer than low volatility JP-8 (previously regarded less flammable) in terms of fires caused by gun-fire, crash landings, leakages of fuel onto hot engine surfaces, and similar situations in which fires may result from contact of fuel with hot metal surfaces rather than by ignition by flames.

MICROWAVE MEASUREMENTS

by

Beryl L. Barber

ABSTRACT

The testing of MMICs becomes the major cost/time factor in the production/cost of MMICs when the large quantity required is considered.

The theory developed to test a device (MMIC) is considered and a proposed technique is given. Test measurements are based upon the minimum number of set-up changes required, and a maximum yield of information. Qualitative rather than quantitative data is considered.

IDENTIFICATION TECHNIQUES USING FRAGMENTARY HUMAN BONE

by

William M. Bass, Ph.D. D.A.B.F.A.

ABSTRACT

Air Force crash investigators are frequently required to identify crash victims from fragmentary remains. Research, training and development of techniques using all available scientific methods in human osteology, especially bone fragments, are essential to the proper performance of the investigators duties. Current techniques in Forensic Anthropology, and specific areas of research needs of human identification experts were explored.

A NUMERICAL SIMULATION OF THE FLOW FIELD AND HEAT TRANSFER IN A RECTANGULAR PASSAGE WITH A TURBULENCE PROMOTER

by

Bryan R. Becker, Ph.D, P.E.

ABSTRACT

In the design of gas turbine engines, there are numerous heat transfer and fluid flow phenomena which need to be better understood. In particular, air is extracted from the compressor and is routed through small rectangular cooling passages within the turbine blades. Accurate prediction of the local heat transfer rate within these cooling passages is necessary to achieve a design of these components which incorporates efficient cooling. In the current study, the turbulent 2-D Navier Stokes equations are solved numerically to predict the flow field and local heat transfer rate from an isothermal wall in a rectangular passage with a turbulence promoter. Plots of the flow pattern, velocity profiles and temperature profiles are given, as well as tables of skin friction and local heat transfer rate. It was found that the widely used Reynolds Analogy greatly underpredicts the heat transfer rate as given by a direct calculation using Fourier's Law.

SYNERGISTIC EFFECTS OF BOMB CRATERING

by

Charles J. Bell, Jr.

ABSTRACT

Analysis of data from earlier tests of detonations beneath simulated runways was accomplished. The literature pertaining to undersurface detonations of high explosives was surveyed. Relationships between distance, time, and pressure from the literature were compared to data from earlier tests at Eglin. A modified equation was proposed for pressure waves in soils.

A failure criterion for structures was applied to the unreinforced slabs in use on the Eglin test range. This criterion was used to estimate values of parameters in the classical and proposed equations for shock wave pressure in sandy loan and in clay soils.

An equation was developed for calculating the distance between charges that results in maximum synergistic pressure on the bottom of a runway slab. Examples of application are presented.

Construction Contract Administrator's Technical Handbook

by

Kweku K. Bentil

ABSTRACT

Construction contracting is a complex and intricate process. Successful administration of these contracts therefore requires a combination of technical and administrative backgrounds. While there are several guides covering some of the administrative aspects, very little is provided in the technical area to assist base contracting personnel to better understand those on whom they depend for technical expertise (Civil Engineering), and those with whom they have to communicate technically throughout the duration of a contract. There is, therefore, a need for a handbook to help bridge the gap between the non-technical contracting person and their technical counterparts (Civil Engineering and Contractors). This handbook is designed to provide general information on the basic fundamentals of construction technology, construction cost estimating, construction progress scheduling, contract documents, effective contract administration and computer applications in the construction industry. It is illustrated with figures and charts and ends with quick reference appendices of tables, formulae, etc. and a bibliography of suggested reference books.

Least Squares Estimation Theory and Geometrical Smoothers

By

David Betounes

ABSTRACT

Research was conducted on possible improvements to the current algorithm for producing Time, Space, Position, Information (TSPI) from cinetheodolite tracking data. The current AD/KR program THEOD for producing TSPI employs the Davis algorithm with weights reflecting the observation errors in the tracking cameras but not reflecting the geometry of the cameras relative to one another as well as in relation to the object being tracked. These latter factors were incorporated into the Davis algorithm by means of various weighting schemes, and computer simulation studies were conducted to test the effectiveness of these schemes in producing better TSPI. Since the topic of research is a special case of non-linear (weighted) least squares estimation theory, a study of the theoretical foundations was conducted as well. Closely related to this is the use of filter/smoothers to produce the TSPI, and (following the ideas of Cranford and Lindegren) a secondary focus of the research involved building a new smoother based upon the geometry of the Frenet frame and helix of curvature. This is the subject of an ensuing grant proposal.

Increasing Work Capacity of Personnel Wearing

Protective Clothing in Hot Environments

by

Phillip Bishop

ABSTRACT

It has been established that the use of protective clothing such as the Chemical Defense Ensemble (CDE) in moderate to hot environments substantially reduces work capacity. The purpose of this research was to determine the efficacy of rest and microenvironmental cooling in increasing work capacity in a hot environment. Rest proved of limited value but microenvironmental cooling increased work duration 104 percent. Final mean rectal temperature, skin temperature, heart rates, and sweat production rates were substantially lower for the cooled condition compared with the no cooling condition despite longer work times. Only working heart rate was higher in the cooled condition. The liquid cooling system removed 73% of the metabolic heat generated during the total work-rest period.

User-System Interface Standards

Dr. Jerome Blaylock

ABSTRACT

Numerous base-level logistics application systems are being developed within the Air Force for various micro, mini, and mainframe computer systems. There do not currently exist adequate standards for the user-system interface. As a result, each system contains its own user interface. It is not unusual to find at a single workstation applications that run on a variety of micro, mini, and mainframes under different operating systems, each with its own unique user interface.

This report documents the results of an analysis of the feasibility of developing user-system interface standards for Air Force base-level logistics computer application systems. It recommends that user-system interface standards be developed for base-level logistics systems based on existing guidelines for developing user interface software that have previously been developed for the Air Force. The user-system interface standards should first be developed for IBM compatible microcomputers under MS/DOS and OS/2, and implemented in a prototype system. Other related conclusions and recommendations are provided.

Fourier Transform Infrared Studies of Ethylenediammonium Dinitrate And 1,4-Butanediammonium Dinitrate

by

John M. Bopp, Jr.

ABSTRACT

The structure of two salts, ethylenediammonium dinitrate (EDD) and 1,4-butanediammonium dinitrate (BDD) were investigated using Fourier transform infrared spectroscopy. Spectra were taken of solid EDD in reflectance and transmittance mode to examine a solid to solid phase transition. These results were compared to data obtained using differential scanning calorimetry. Transmittance spectra were obtained of the molten state of EDD and of two of its deuterated forms. Solid and molten spectra were taken of BDD as well as of six molten samples of various deuterated forms. Attempts were made to relate infrared absorption features to specific functional groups.

A "Form and Function" Knowledge Representation for Reasoning about Classes and Instances of Objects

by

Kevin W Bowyer

ABSTRACT

This report outlines an approach to combining knowledge about functionality of an object with knowledge about the geometric form of an object. The representation of geometric form allows an object to be defined as an interconnection of multiple components. Different types of connections are defined in order to allow different types of relative movement between components. The representation of intended function of an object is handled by procedural attributes attached to components of an object. The combined "form and function" knowledge representation allows modeling of classes, subclasses and specific instances of an object. The ability to model object classes allows us to investigate questions of how new subclasses and instances are learned.

AN ANALYSIS OF INFRARED LIGHT PROPAGATION IN HOLLOW METALLIC LIGHT PIPES

by

Lee. I. Britt

ABSTRACT

An analysis of electromagnetic wave propagation at optical frequencies was performed using the Fourier method, for waves in hollow metallic ducts. Solutions for monochromatic plane wave propagation in hollow metallic light pipes were determined for straight cylindrical,rectangular and curved geometries. These solutions yield an infinite series representation of the generating function in each case that is characteristic of the wave guide geometry.

Useful parameters relating to the minimum loss dominant mode are pointed out in each case. Power loss considerations in each geometry lead naturally to exact expressions for attenuation in each guide. A perturbation technique is pointed out that will take into account the effects of bending in the curved cylindrical guide.

Dr. Richard Brown

ABSTRACT

The toxicity of JP-4 aviation fuel soil residues was assessed in a series of soil bioassays using sorghum (Sorghum bicolor), bean (Phaseolus vulgaris), oat (Avena sativa), and cucumber (Cucumis sativus). Sorghum and bean indicated no sensitivity to JP-4 residues in soils contaminated with up to 2000 ppmw jet fuel. Oat and cucumber shoot length and fresh shoot weight was stimulated in samples contaminated with up to 2 ppmw and inhibited in soils receiving 2000 through 200,000 ppmw of JP-4. An ED_{50} is indicated between 20,000 and 200,000 ppmw of JP-4 for both oat and cucumber.

DYNAMICS OF A METALLIC JET

by

Robert A. Buchl

ABSTRACT

The dynamics of a shaped charge metallic jet is discussed for two cases, jet formation and jet penetration into a semi-infinite target. The equations of motion which govern a metallic jet are presented which incorporate a velocity gradient and the Bernoulli hydrodynamic equation. The equations of motion are solved analytically and describe jet elongation and jet penetration. Jet particulation and the energy expenditure in the penetration process are considered.

Reactions of Nitryl Chloride with Aromatic Substrates in Chloroaluminate Melts

by

Charles M. Bump

ABSTRACT

An ionic liquid composed of 0.667 mole fraction aluminum chloride and 0.333 mole fraction 1-methyl-3-ethyl imidazolium chloride was employed as the solvent for electrophilic aromatic nitration using nitryl chloride (NO_2Cl). Nitrations of toluene, benzene, chlorobenzene, acetophenone, and nitrobenzene were studied. In addition, the reaction of nitryl chloride with methylethylimidazolium chloride and with aluminum chloride was investigated. Even weakly deactivated aromatic substrates were nitrated in this study. Only nitrobenzene was not successfully nitrated. The imidazolium chloride moiety itself reacted with nitryl chloride to give chloronitromethylimidazoles on hydrolysis. Aluminum chloride reacted with the nitryl chloride to give a compound which may be nitronium tetrachloroaluminate ($NO_2^+ AlCl_4^-$). This compound successfully nitrated benzene.

CHEMISTRY FOR THE SPACE PROGRAM

by

Allan R. Burkett

ABSTRACT

This report consists of a review of what has been done in four broadly defined areas of the space program as well as some speculation on likely productive lines of work for future researchers. The areas reviewed are: (1) Interaction of Atmospheric Free Radicals with the Space Station, (2) Hiding a Craft from IR Detectors, (3) Solar Energy Trapping, and (4) Regeneration of Necessities. The most promising lines of research are in the use of metallopolymers for energy trapping and electrode coatings, and in the use of transition metal complexes in reduction of carbon dioxide.

BAYESIAN TESTABILITY DEMONSTRATION

by

Ronald V. Canfield

ABSTRACT

The purpose of this work is to explore the use of Bayesian methods in testability demonstration. The primary focus is on prior information. The role and sources of prior information are discussed. A general method of quantifying prior information is developed based on the intuitive concepts of location and equivalent sample size. Two testability demonstration plans are derived. The first uses standard Bayesian risk concepts. This method requires extensive tables or graphs. The second plan introduces an alternative by controlling the maximum risk similar to the classical non Bayesian tests. Imlementation of this method is much simpler than the standard test. Similarity of the new test to the non Bayesian fixed sample test suggests that a simple Bayesian sequential test is possible.

HYPERTEXT AND THE INTEGRATED MAINTENANCE INFORMATION SYSTEM (IMIS)

by

Patricia Ann Carlson

ABSTRACT

The Integrated Maintenance Information System (IMIS) concept is to provide the technician with all logistical, operational, technical, training, and diagnostic information for aircraft repair. Because of the sheer amount of information being integrated, user overload is a significant concern.

The traditional solution to this problem of presenting complex information in a timely fashion is to design a consistent display format and to employ standard commands. At a deeper level, however, questions of information integration become issues of information engineering and the nature of knowledge structures.

At this level, the definition of user interface takes on a more sophisticated meaning. The hypertext concept considers a body of knowledge as a database -- potentially, a highly organized, compressed structure of richly interconnected "chunks" -- and allows for flexible indexing and retrieval by implementing a "smart" interface (a programmable "idea processing" mechanism).

Hypertext, as the backbone for development philosophy, permits advanced design features -- such as enhanced functionality, customized views, and improved knowledge synthesis and representation -- which, in turn, increase the user's ability to interact productively with information.

Dopant diffusion in nipi Semiconductor Superlattices

by

Kwo-Sun Chu

ABSTRACT

Matrix elements of dopant diffusion tensor parallel and perpendicular to the crystal growth direction in a nipi semiconductor superlattice are obtained using the time expansion of the momentum autocorrelation function technique. Truncation of the series is justified by a self-consistent scheme in which the concept of the memory of the system is employed. Superlattice potential is taken as the superposition of the space charge potential and the host substrate lattice potential. Numerical calculations are carried out for Si and Be doped GaAs superlattice.

Dr. David Chung

ABSTRACT

A number of small optical cells were constructed and tested for the purpose of studying small one-dimensional crystals. The optical properties of two types of needle-shaped crystals (natural and synthetic) were studied in some detail. Preliminary tests show that the small cell method developed here has potential for future applications of these new classes of optical materials. This method can also be applied to studies of nonlinear effects in one-dimensional crystals, e.g., harmonic generation, Raman and Brillouin Scattering.

The Effect of Model Flexibility on the Accuracy of Aerodynamic Coefficients Determined from Free-Flight Ballistic Tests

by

Dr. Robert W. Courter

ABSTRACT

The objective of the present research was to determine the influence of ballistic model flexibility on aerodynamic coefficients determined from free-flight ballistic tests by parameter estimation methods based on rigid body theory. General equations defining the dynamic behavior of a flexible body were derived. Body flexibility introduced two additional types of terms into the normal rigid-body equations: inertia coupling terms and aerodynamic coefficient terms. The inertia coupling terms were evaluated by performing a simulation study of a high fineness-ratio penetrator configuration. Preliminary results indicate that flexibility within normal structural limits does not influence the body trajectory or the accuracy of the aerodynamic coefficients determined from rigid body theory.

TUNABLE ABSORPTION IN SUPERLATTICES

by

Bruce A. Craver

ABSTRACT

A review of the theory of superlattices and quantum wells, and the theory of optical absorption in these structures, was conducted. A comparison is made between the mechanisms for tunable absorption in quantum wells and doping superlattices. For quantum wells, tunable absorption is achieved by the quantum confined Stark effect, and in nipi's by a tunneling-assisted absorption, i.e. Franz-Keldysh effect, induced by an internal electric field arising from the superlattice potential caused by ionized donors. Suggestions concerning the future research direction of the nonlinear optics group are offered.

Computer Simulation of Adaptive Resource Management in Real-Time

by

William K. Curry

ABSTRACT

Using computer simulation, a study was made of the management of limited, specialized resources, under real-time response constraints. The primary focus was the automatic control and assignment of Electronic Counter Measure (ECM) resources for an aircraft operating in a hostile electronic environment. Techniques from the fields of Artificial Intelligence and Object-oriented system design were utilized in an attempt to maintain this real-time response in a very large space of possible situations. We also attempted to create a system with adaptive characteristics to allow for simple, unassisted "learning" of the proper responses to unanticipated situations.

Effect of Wind and Turbulence on an Artificially
Generated Strato-Mesospheric Plasma

by

Phanindramohan Das

ABSTRACT

The important principles relating to the generation of an Atmospheric Ionization Mirror (AIM) in the strato-mesospheric regions are reviewed. An equation on plasma evolution which includes ionization by high power microwave breakdown, and plasma loss by attachment to neutral particles, recombination, and by advection due to neutral air motion, is analyzed for relative importance of these factors in determining the steady-state condition of the artificially ionized region. The theory predicts that for a steady-state AIM to be possible, extremely weak winds are desirable.

The climatology of the middle-atmospheric winds is reviewed: it is found that strong winds are the rule in this region, with speeds close to 200 m s^{-1} being on record. There also are wide variations of winds both in space and time. While winds with speeds less than a few meters per second are desirable for a steady AIM, actual winds of several tens of meters per second need to be allowed for in an experimental design of an AIM.

Analysis and Modeling of the Thermal Response of an Autoclave for Expert System Control of Carbon-Epoxy Composite Fabrication

by

Bruce A. DeVantier

ABSTRACT

An analysis is performed to determine the thermal properties of an autoclave used for the production of epoxy based carbon fiber composites. The emphasis in the work is the development of a model of autoclave response for use in model simulation of a process response to expert system control. The model developed is capable of reproducing the response of a small autoclave currently used during expert system control of the epoxy curing process. Verification is made by comparing the model prediction to test measurements made during an autoclave heatup and cooldown. The computer coding for the thermal model is in both FORTH and FORTRAN languages. The FORTH version is included because the expert system control shell is written in this language, and the possibility of real time application is considered. The FORTRAN version is used in a process simulation mode, in conjunction with an epoxy composite curing model, and the language choice is necessary because of compatibility with the curing model. The model has been tested in this simulator mode, and realistic response was noted. Five parameters are used to fit the autoclave response in the heating and cooling modes. The parameters result from a lumped mass formulation and include thermal masses of the autoclave solid structure and the internal gas, as well as heat transfer coefficients. The values of these fitted constants reveals a relatively stable control system, with a damped response due to significant loss of heat to surroundings in comparison to the thermal masses involved.

A STUDY OF SERVICE DEMAND DISTRIBUTION AND TASK ORGANIZATION FOR THE ANALYSIS OF ENVIRONMENTAL SAMPLES AND ASSOCIATED SUPPORT SERVICES AT THE USAF OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY - BROOKS AFB, SAN ANTONIO, TEXAS

by

Don E. Deal
Gary Lake

ABSTRACT

A review of historical data was undertaken to assess the trends in and present status of the laboratory's ability to accomodate sample analysis workloads; short term projections for the growth in requests for analysis were also made for major sample classes. From numerous interviews with key supervisory and bench personnel, a list of problems and concerns was compiled which together comprised a substantial group of throughput-limiting elements. Workload projections were then analyzed in conjunction with these problem area data and with OEHL long term plans to produce a number of recommmendations for increased efficiency. These recommendations focus on glass washing turn-around, acquisition of vital personnel, lab automation, and management of contract lab participation.

Vectorized Perturbed Functional Iterative Scheme (VPFIS) for Numerical Solution of Nonlinear Partial Differential Equations

by

Suhrit K. Dey

ABSTRACT

Perturbed functional iterative scheme (PFIS) was developed in [1] and applied successfully to solve nonlinear partial differential equations. With the advent of a new era of supercomputers and vector processors the algorithm of PFIS has been modified. This modified scheme could solve implicit approximations of nonlinear partial differential equations in an explicit mode of computation so that no Jacobian is computed and no factorization of matrices is needed. It displays a superlinear rate of convergence. Two dimensional Euler-type nonlinear hyperbolic partial differential equations have been successfully solved using vectorized PFIS. An implicit version of this code has also been formed. In comparison with other implicit finite difference codes, the present code does not require inversion of any block matrices. Also, the algorithm of the present scheme appears to be much simpler.

AN EIGHT-DOMAIN FRAMEWORK FOR UNDERSTANDING INTELLIGENCE AND PREDICTING INTELLIGENT PERFORMANCE

by

Ronna F. Dillon
Catherine Aubertin

ABSTRACT

This paper describes my participation in the 1987 Summer Faculty Research Program in the Test and Training Branch of the Air Force Human Resources Laboratory at Brooks Air Force Base. My activities centered on elucidation of an eight-domain model of aptitude and use of the model in (a) conceptualizing and writing materials for a national research symposium on measuring and predicting professional competence across a range of professions and for a biennial conference on individual differences in cognition and learning, and (b) undertaking a program of research on the importance of measures of each domain for predicting school and job performance among Air Force recruits. The eight-domain framework taps processing capacity, processing speed, declarative knowledge, information-processing components, information-processing metacomponents, rule induction skill, verbal and visiospatial knowledge manipulation skills, and cognitive flexibility.

MICROSTRUCTURAL DEVELOPMENTS IN TITANIUM ALUMINIDES: A STUDY OF DYNAMIC MATERIAL MODELING BEHAVIOR

BY

RAVINDER M. DIWAN

ABSTRACT

The material behavior of the TiAl system, PREP-HIP Ti-48Al-1V, has been investigated by dynamic material modeling using the flow stress data from constant strain rate hot compression tests for strain rates ranging from 10^{-4} to 10^{-1} S^{-1} and temperatures form 1000°C-1250°C. Phases were identified which are related to the transformation temperatures of the alloy in phase equilibria; also, stability and instability regimes in the processing or stability maps were identified. The results indicate the presence of twins in the γ-phase, very small amounts of dispersed α_2-phase, significant amounts of cross slip and shear bands with possible texture effects, and, at certain strain rates and temperatures, formation of subgrains was observed.

The TiAl system is characterized by the presence of strong directional bonding of the γ-intermetallic phase and its related strengthening effects. The structural morphology and quantitative parameters need to be further investigated at higher temperatures above 1250°C to analyze completely the constitutive and mechanical behavior of this system. Mechanical instabilities in certain regions are seen to be more dominant than metallurgical instabilities because of the strong thermodynamic stability of γ-TiAl.

ADA AND ARTIFICIAL INTELLIGENCE APPLICATIONS FOR ELECTRONIC WARFARE

by

Verlynda S. Dobbs

ABSTRACT

The appropriateness of Ada for artificial intelligence applications for electronic warfare (EW) was investigated. The investigation included a review of current efforts and the implementation of a prototype system for an EW application. The system, which applied bidirectional heuristic search techniques to the generation of flight paths through a military hostile environment was successfully implemented in Ada. Results provided data for the comparison of two bidirectional heuristic search techniques.

Computational Simulation of Transonic Store Separation

by

F. Carroll Dougherty

ABSTRACT

The preliminary development of a numerical simulation capability using finite-difference techniques for flows about aircraft carrying stores is described. Since a single global mesh about the aircraft with stores is very difficult to generate, a multiple overset mesh approach called the chimera scheme is used. In the chimera scheme, a complex configuration such as a wing with stores beneath it is mapped with a global mesh about the main component, the wing, and with minor overset meshes generated about each additional component such as the stores. The minor meshes can be overset on the global mesh without matching any boundaries, so they can be freely moved with respect to the global mesh. Therefore, the time-accurate simulation of a moving store beneath a wing is possible without regridding the configuration. This research effort involves coding the three-dimensional chimera grid package for moving meshes, then coupling the grid management routines with a time-accurate Euler flow solver.

GUIDED WAVES IN MILLIMETER WAVE CIRCUIT DESIGN

by

John M. Dunn

ABSTRACT

Guided waves are investigated as a way to overcome a number of problems currently encountered in millimeter wave circuits. At the present time, microstrip elements are exclusively used in such circuits. Guided waves have a number of advantages for certain applications. For example,they exhibit lower power loss than do microstrip lines. Typical loss figures are given for a GaAs substrate. A typical circuit would use guided waves to transfer power and information from one major sub-section to another. The microstrip would be reserved for use in relatively small areas. Such a circuit will therefore employ both guided wave and microstrip elements. In order for guided waves to be effectively used, it is necessary that one can be efficiently launched from a microstrip. One possible method capable of monolithic integration is given. Another advantage of guided waves at high frequencies, is the possibility of a broadband antenna. The broader bandwidth comes from the fact that the antenna does not utilize a resonant element. A possible design of such an antenna is given, along with a number of design considerations. The emphasis in this report has been one of using simple physical concepts to examine the feasibility of the approach. No effort has been made to carry out sophisticated mathematical analysis. Instead order of magnitude calculations have been used whenever possible.

Slew-Coupled Structural Dynamics Identification and Control

by

Thomas A. W. Dwyer, III

ABSTRACT

Dynamic system identification and control algorithms are derived in this report for slew-induced deformation shaping of elastic rotational structures.

In particular, the importance of the coupling matrix between rotational and vibrational accelerations is exhibited, for use both in structural system identification and for the control of acquisition, tracking and pointing maneuvers.

A possible experiment for the validation of such identification and control algorithms on available Air Force Laboratory facilities is also described.

THE EFFECTS OF METAL MUTAGENS ON THE SYNTHESIS AND ACCUMULATION OF MACROMOLECULES

KIAH EDWARDS, III

Cellular and Molecular Biology, Department of Biology,
Texas Southern University
Houston, Texas 77004

ABSTRACT

In an effort to further elucidate the profound effects of environmental pollutants on biological systems, this study was under taken to determine the effects of metal ions on the rate of synthesis and accumulation of total RNA using rabbit uterine DNA. Eight of the metals (cadmium, cesium, cobalt, copper, lead, mercury, selenium and silver) enhanced the initiation of RNA synthesis at concentrations that inhibited overall RNA synthesis. These data indicate that metal mutagens and carcinogens not only decrease the fidelity of DNA replication but also exert their effects at the level of RNA initiation and total RNA synthesis. Additional bindings indicate the inhibitory effects of cadmium on the synthesis of total protein found in uterine secretions.

SCALING LAWS OF 2-D NOZZLE PLUMES

by

Marco A. Egoavil

ABSTRACT

The design of high performance aircraft features two dimensional nozzle with known infrared radiation characteristics. Mean velocity and temperature profiles of rectangular outlet nozzles plumes having different aspect ratios and nozzle geometries must be established.

Scaling laws for the calculation of 2-D nozzle plumes under a free velocity field have been developed. The modeling technique used by other investigators in solving the problem under static conditions, has been extended to the present case, which involves 2 different boundary conditions of free stream velocities.

The main element of the model is a scaling factor as a fraction of the axial distance of the plume. The present study proposes that the representation of the scale factor be taken as follows : a straight line equation for the constant velocity free stream field; a second degree equation for the boundary layer velocity free stream field; and the third degree equation for the 2-D nozzle plume flow field.

The plume flow field and the external flow have a matching region that is defined by applying the conservation of mass equation.

The validation of the proposed method is part of the proposal that will be presented to the Air Force by the University of Puerto Rico.

Computation of Rutherford Scattering Cross Sections

by

Ira T. Elder

ABSTRACT

Computation of Rutherford (or Coulomb) cross sections for scattering from angular bin to bin involved computing a triple (iterated) integral. The triple integration was performed numerically using an adaptive Simpson's quadrature formula programmed in FORTRAN. Three copies of the numerical integrator were necessary in order to prevent a subroutine from attempting to call itself recursively. An error tolerance was specified to help control and estimate the error. The adaptive method refines (generates subintervals) until the error tolerance is satisfied or to a maximum number of subintervals. The computed cross sections were used in the code PTRAN for transport of charged and neutral particles.

Database Processing in Real-Time Systems

by

Ramez A. Elmasri

ABSTRACT

Real-time systems consist of a number of tasks, or processes. Whenever a task is invoked, it must be executed completely by a certain time deadline in a "hard" real-time system. In a "soft" real-time system, the value of a task to the overall system declines if it has not completed execution by a certain critical time. In most existing real-time systems, tasks are independent from one another and no access to shared databases by the tasks is considered.

In this work, we examine the issues that arise when shared databases are included in real-time systems. We identify research problems that must be resolved before shared databases can be successfully incorporated into real-time systems. These issues include specifying the timing characteristics of database operations; scheduling of database operations by real-time schedulers; using main memory for storage of "currently-in-use" portions of a database to improve performance; and issues that deal with the replication and distribution of the database.

NON-UNIFORM SPATIAL SYSTEMS AND THE TRANSITION TO TURBULENCE

by

John E. Erdei

ABSTRACT

The transition characteristics of a vertical Bénard Cell are studied through the use of slow amplitudes, or order parameters. In a previous study of the cell, it was assumed that the order parameters were spatially uniform, and an appropriate equation of motion was derived which described the temporal evolution of spatial states. The work given in this report extends the previous derivation by allowing non-uniformities in the spatial states. The final form suggests that if the conditions are favorable, the cell can become convectively unstable. Experiments on the cell appear to be in support of this contention.

During the course of the summer research period, other experiments which could be used to test the predictions of the order parameter models have been given serious consideration. In anticipation of a need for analysis of the experimental data, various computer routines have been written. For completeness, a brief description of each of the routines is also given in this report.

BANK-TO-TURN CONTROL OF AIR-TO-AIR MISSILES

by

Joseph J. Feeley

ABSTRACT

Future Air Force missions will require air-to-air missiles with an asymmetrical cross section and a chin-inlet ramjet engine. These missiles will require advanced guidance and control systems to achieve necessary maneuverability and to avoid engine flame-out during lateral turns. The control strategy for these new missiles is termed bank-to-turn as opposed to the skid-to-turn strategy used in current missiles. This report summarizes the dynamics of the missile-target encounter, highlights the assumptions frequently made in missile autopilot design, and recommends further study of an integrated guidance and control system based on optimal differential game theory.

BORAZINE REACTIONS

by

Wilton Flemon

ABSTRACT

It has being known that certain covalently bonded cyclic compounds containing boron atoms linked to nitrogen atoms, externally bonded to nitro groups, amino substituents or polyintroaliphatic groups, were useful in the manufactures of chemicals that may be useful as propellants, explosives or other energetic related substances. The parent compound borazine (Stock, 1933) has been of especial interest in the preparation of these materials.

The direct or indirect preparation of these compounds by nitrolysis, aminolysis and/or polynitroalkylation of some N-tertiary aliphatic-B-haloborazines may be a route to the synthetic preparation of some of these compounds. Convenient methods to directly synthesize some N-aliphatic-or aryl-B-chloro or bromoborazine are known, however, direct synthesis of N-aliphatic-or aryl-B-fluoroborazine has been reported with difficulty (Steinberg, 1966 and Greenwood, 1954). Methods of dehydrofluorination of boron trifluoride amine adducts using metals (Kraus, 1930), metal hydrides (Lang, 1963) or organometallic compounds (Dornov, 1958) involves vigorous conditions, that are not suited to general laboratory application. B-Trifluoroborazine was reported to be indirectly synthesized (Niedenzu, 1962, 1963) and (Laubengayer, 1963). Other procedures using radical conditions (Wiberg, 1951) or difficultly obtainable reagents (Sujishi, 1957) gave unsatisfactory results.

Amine adducts using metals (Kraus, 1930), metal hydrides (Lang, 1963) or organometallic compounds (Dornov, 1958) involved vigorous conditions, that are not suited to general laboratory applications. B-trifluoroborazine was indirectly prepared (Niedenzu, 1962, 1963) and (Laubengayer, 1963) or difficultly obtained reagents (Sujishi, 1957) gave unsatisfactory results.

Harris, 1969, reported that N-tri-primary alky-B-trifluoroborazines were readily prepared by dehydrofluorinating primary amine adducts of boron trifluoride etherate or salts of fluoroboric with adducts of hindered, preferably tertiary amines with boron trifluoride.

This method was used to attempt to synthesize N-tri-tertiary butyl-B-trifluoroborazine, N-tri-acetyl-B-trimethylborazine and N-tri-tertiary butyl-B-trimethylborazine which would serve as precursors in the nitrolysis reactions. Attempts to synthesize the compounds failed.

Harris, 1969, reported that N-tri-alkyl-B-trifluoroborazines were readily prepared by dehydrofluorinating primary amine adducts of boron trifluoride etherate or salts of fluoroboric acid with adducts of hindered, preferably tertiary amine adducts with boron trifluoride.

The method of Harris, 1969, used to attempt to synthesize N-tri-tertiary butyl-trifluoroborazine, N-tri-acetyl-B-tri-methylborazine and N-tri-tertiary butyl-B-trimethylborazine, compounds which serve as precursors in nitrolysis reactions. Attempts to synthesize these compounds were unsuccessful.

CHEMICAL AND SPECTROSCOPIC EVALUATION OF ANTIMONY SULFIDES

by

Dennis R. Flentge

ABSTRACT

Samples of Sb_2S_3, Sb_2S_4, and Sb_2S_5 were examined using infrared, Raman, and quantitative techniques to determine what factors contribute to the ability of Sb_2S_4 to enhance the lubricating ability of MoS_2. The antimony sulfides were extracted using either isooctane or carbon disulfide and the extracted material was examined using infrared spectroscopy. No definite conclusions were reached concerning the source of the enhancing ability of the Sb_2S_4.

The Evaluation of a Thermal-Hydraulic Design of a Fixed Particle Bed Reactor and Suggested Model Revisions

by

L. D. Flippen, Jr.

ABSTRACT

The thermal-hydraulic model used by the Brookhaven National Laboratory in their design of a fixed particle bed nuclear reactor for space propulsion applications has been evaluated. Possible areas of concern have been identified which suggest either further investigation or actual model revision. Considering the extremes between the simple Brookhaven model and a cumbersome all-inclusive model, it is suggested that an intermediate model be used which is easily expanded (if the need arises). Work has been initiated on the implementation of such an intermediate model.

SIFT STUDIES OF GAS PHASE ION-MOLECULE REACTIONS

by

Dr. Lee A. Flippin

ABSTRACT

The kinetics and product distributions of gas phase reactions of hydroxide ion, OH^-, with organic epoxides and episulfides were studied using the Selected Ion Flow Tube (SIFT) technique. Ethylene oxide and ethylene episulfide apparently undergo addition of OH^- followed by fast fragmentation to afford m/e = 59 ($C_2H_3O_2^-$) and m/e = 33 (HS^-), respectively. Propylene episulfides and epoxides with two or three C-H bonds adjacent to the three-membered ring undergo rapid proton transfer to OH^- to afford m/e = M-1 products exclusively.

Selected perfluoroalkyl metal carbonyls were synthesized for SIFT studies of electron attachment reactions.

Silicon Junction - DIFET Electrooptic Modulator

by

Lionel R. Friedman

ABSTRACT

In-house work at RADC/ESO has established that crystalline silicon is an attractive waveguide medium for 1.3-1.55 μm optical transmission. In an effort to provide active guided-wave components in silicon, we have considered a novel, double-injection transistor for the control of integrated-optical switches and modulators. It has been shown that large concentration of electrons and holes are possible due to double injection, and that this injected plasma substantially perturbs the refractive index. It has also been shown that the effective index change can be controlled by voltage-variable depletion widths adjacent to one or two gate electrodes. Numerical estimates of the injected densities and the effective index changes have been made for both of these cases. Limitations of the theory and the role of recombination are discussed.

Phase Behavior of Poly(p-phenylene benzobisthiazole) Molecular Composites

by

John W. Gilmer

Abstract

New high strength, high modulus molecular composite materials are being fabricated by utilizing a rigid rod polymer molecule as the fiber which is molecularly dispersed in a flexible coil matrix. As phase separation proceeds, the rod is no longer molecularly dispersed and its ability to reinforce the flexible coil matrix is decreased. The phase behavior of poly(p-phenylene benzobisthiazole)(PBT) containing molecular composites was characterized in this study by small angle light scattering (SALS). In characterizing these materials, accomplishments were made in three areas: development of light scattering software and instrumentation; preparation of a prospectus for future studies of molecular composites by neutron scattering; and SALS measurements during phase separation for molecular composites containing PBT in benzocyclobutene and PBT in amorphous nylon.

Stephen J. Gold

ABSTRACT

This paper describes the design and performance expectations of an Omnidirectional Torquer, which is a special kind of induction motor. The rotor is a sphere, and the useful output is the countertorque that the rotor exerts on the stator while the rotor is being accelerated. The machine has three distributed stator windings surrounding orthogonal axes. Quadrature currents in the form of $i_1(t) = I_m\cos(\omega t)$ and $i_2(t) = I_m\sin(\omega t)$ flowing in any two of these windings will create a rotating magnetic field whose pattern is a spherical surface zonal harmonic of order 1. This moving field induces currents in the rotor's silver suface conductors, which interact with the magnetic field to create torque. To make the machine work in 1 g. environments, the rotor is suspended with neutral bouyancy in a dense $ZnBr_2$ solution.

A computer simulation was done. Results show that torques of up to 2.7 Newton-meters are possible, in any direction. The torque produced by this machine is in most cases very nearly parallel to the axis of the rotating stator field, even when the rotor is initially rotating at nearly right angles to that axis.

Acoustic Emission and the Fracture Behavior of 2-D Carbon-Carbon

Dr. Michael R. Gorman

Abstract

Very limited data on the acoustic emission behavior of C-C material can be found in the literature.

Tensile coupons 10" x 1" x 1/4" were machined from flat plates made of 2-D Carbon-Carbon material and subjected to uniaxial loading in either the warp or fill directions. The specimens showed a notch sensitive fracture behavior when quasistatically loaded to failure. The quality of the material was documented by photomicrographs. The average density was approximately 1.6 g/cc and the strength values in the warp direction were about 14 ksi for the unnotched specimens. The AE parameters recorded included counts, duration, amplitude, and energy. They are being studied for correlations with the observed fracture behavior.

Dr. Benjamin Gottlieb

No Abstract Submitted

At This Time

High Amplitude Aiorfoil Motion Using Point Vortices

by

Gary M. Graham

ABSTRACT

An analytical model which predicts the aerodynamics of a two-dimensional airfoil experiencing a rapid pitch-up maneuver has been developed. The model is based on simulating the vortex shedding of an airfoil as it moves in an otherwise quiescent fluid. The onset of leading edge flow separation which occurs at high angles of attack is predicted using an empirical correlation for the case of constant pitch rate. The aerodynamic loads are computed using a momentum approach based on an unsteady Blasius integral. The results of these calculations may be useful in applications such as the concept of enhanced maneuverability of fighter aircraft.

LIQUID FILM COOLING OF ROCKET ENGINES

by

William M. Grissom

ABSTRACT

The cooling of the combustion chamber walls in a rocket engine by a liquid film is analyzed. The evaporation rate is calculated from the dry-wall heat flux modified by a transpiration correction due to the blowing vapor generated. The mixing of the vapor with mainstream gases in the boundary layer above and downstream of the liquid film is studied. The convection rate of coolant into the mainstream is also inferred from this analysis. Estimates of the radiant heat transfer show that it can account for the difference between the convective calculations and experimental measurements. Radiant heat can also cause problems such as burnout of the liquid film.

Cellular Logic Image Processor Evalulation

by

Timothy A. Grogan

ABSTRACT

Benchmark operations were performed on the British-built Stonefield Mark I 32x32 element cellular logic image processor(CLIP). A comparision was made to benchmark results reported in the literature for other parallel computers with specialized architectures for image processing. Performance estimates of the 128x128 element Stonefield Mark III CLIP design were obtained. The Mark III design has a price-performance ratio exceeding the MPP by a factor of five. A subjective evaluation of the Mark I CLIP software was also performed.

Recommendations are made for the benchmark testing of the Mark III. In addition, issues regarding the integration and utility of the Mark III as part of an imagery exploitation system are discussed.

Thermal Decomposition Investigations of Candidate High Temperature Base Fluids II. Silahydrocarbons

by

Vijay K. Gupta and Mark Prazak

ABSTRACT

The effect of molecular structural variations in novel candidate base stocks such as silahydrocarbons on tribological properties such as thermal stability was investigated. The silahydrocarbons chosen for these studies contain a silicon atom and three n-octyl groups and another substituent group which provides the structural variation. The structural variations in the substituent group are the size, branching, the position of the branching, the presence of double bond, and the variation in the position of the double bond. The thermal stability of the above compounds was determined, and the extent of degradation was measured using gas chromatography, viscosity change, and mass spectroscopic analysis. Interesting trends were found and the rationale for these trends is presented.

EFFECT OF SURFACE STATES ON THE ELECTRONIC TRANSPORT PROPERTIES IN SEMI-INSULATING GaAs

by

Narayan C. Halder

ABSTRACT

The electronic transport properties (electrical conductivity, mobility and carrier concentration) have been measured in semi-insulating (SI) GaAs samples as functions of temperature from 250 to 390°K. Several gas ambients (N_2, He, air, and vacuum) were considered to detect any possible effect of the surface states and/or charge accumulation on the surface that might influence the layers immediately below the surface of the samples. Four samples were selected for this study. The results of the present study indicate that there is a marked effect of the conductivity, mobility and concentration data, especially in the low temperature region, in that the slopes of the corresponding temperature dependence plots were different. These results are interpreted in terms of variations of the surface states on the samples due to various gas ambients.

The Surface Primitive Method of Feature Based Computer Aided Design for Manufacture

by

Kenneth R. Halliday, Ph.D.

Abstract

A new method is presented in this paper for structuring the design features which can be used in knowledge based expert systems for the Computer Aided Design, CAD, of mechanical components. This technique, called the surface primitive method, uses information about the properties of the surfaces of a feature in order to explicitly embed manufacturing knowledge into the definition of the feature.

The ideas which are fundamental to the surface primitive method are introduced in this paper. Furthermore, an example of using the method to construct a common CAD feature, a cylindrical through hole, is presented, and the methods used to extract the information about manufacturing from the model are illustrated. In particular, a demonstration program is presented which evaluates the production time and the production cost of the feature from the basic feature definition. Future extensions for this work are discussed.

GUN GAS DIVERSION

by

Elmer C. Hansen

ABSTRACT

The process of gun gas diversion using a single hole perforated disk diverter was investigated with a steady state apparatus. The efficiency of diversion was found to depend on the distance between the muzzle and the diverter disk and the ratio of muzzle pressure to diverter exit pressure. Diversion efficiencies of up to 98% were obtained. A diverter was designed in a multibarrel configuration and tested at the muzzle of two different 20mm guns. Measured diverter pressures were in the range predicted by the original design. High speed motion pictures showed that the great majority of flash and secondary flash was diverted.

Multi-block Grid Optimization

by

David C. Hart

ABSTRACT

A major obstacle in obtaining a numerical solution for the flow around a geometrically complex object is the generation of an adequate coordinate grid. An approach which might minimize this obstacle is decomposition of the flow domain into subdomains, in each of which a grid is generated seperately, and recombination of these multiple blocks into a single global grid. A program has been developed for revising a crudely joined grid into one suitable for computation, by maximizing overall smoothness and orthogonality.

ENCODING IN LESS THAN 100 MILLISECONDS DEMONSTRATED USING A REACTION TIME TASK

by

Terence M. Hines

ABSTRACT

The encoding task of Posner and Boies (1971) was modified to allow the examination of the build up of information in short (117 msec. or less) intervals following stimulus presentation. Significant encoding was demonstrated as early as 67 msec. post stimulus onset. This result shows that the Posner and Boies (1971) task is a useful and valid measure of the time course of encoding even at very short intervals following stimulus presentation. An additional issue investigated was whether there are age differences in the time course of encoding. No evidence for such age differences was found.

Nitrated Heterocyclic Compounds: A Synthetic Study

by

Albert Hirschberg

ABSTRACT

Laboratory syntheses of 1,2,4-triazolin-3-one, 2-imidazolone-4-carboxylic acid, and 2-imidazolone are described. Attempts at converting these compounds to nitro derivatives are also described.

The characterization of 5-nitro-1,2,4-triazolin-3-one and its potassium and ammonium salts was carried out to resolve the mass spectrum anomaly demonstrated by the parent compound.

3,6-Diamino-1,2,4,5-tetrazine was synthesized and oxidation of the amino groups to yield 3,6-dinitro-1,2,4,5-tetrazine was attempted.

A HUMAN FACTORS APPROACH TO THE PROCESS OF DEVELOPING THE ADVANCED METEOROLOGICAL PROCESSING SYSTEM

by

Robert R. Hoffman

ABSTRACT

This is a report on the process used in deriving design specifications for the Advanced Meteorological Processing System (AMPS). The AMPS project has as a goal the development of a workstation environment for the support of meteorological forecasting and research. A major aspect of the AMPS project will be the attempt to integrate Artificial Intelligence (AI) techniques with forecasting procedures. The process used in deriving design specifications involved reliance on human factors principles, structured interviews with meteorologists, and observations of forecasting deliberations. The resulting specifications involve such things as the design of a "user friendly" interface and an answer to the question of how many video displays the workstation will need in order to support the activities of meteorologists. A number of recommendations also derived from this work, involving the follow-up research that will be needed to refine the design specifications, and the qualifications of the support personnel who will be needed to carry out the development phase of the AMPS project.

PRESSURE ATTENUATION IN SOLIDS: A COMPUTER MODEL

by

James Steven Hoffmaster

ABSTRACT

The peak pressure in a material produced by a shock wave decreases as the wave passes through the object. The rate of decrease depends on the size, shape, and molecular structure of the object. Pressure is a key consideration when evaluating insensitive high explosive candidate materials. Current state-of-the-art computer codes are extremely complex and are difficult, time consuming affairs to apply. A simpler, user friendly computer program is described in this report. It is capable of giving peak shock wave pressure at interfaces as well as pressure attenuation as a function of distance in selected materials. Numerical approximation techniques employed are the least squares polynomial fit and Newton's method of iterative solutions for polynomial equations. The results obtained, although less accurate than those of the more complex codes, are far easier to obtain and are sufficiently accurate to be useful in chosing experimental parameters in IHE evaluative testing.

IN SITU DETECTION OF OSTEOPROGENITOR CELLS IN AN ACTIVELY GROWING BONE SYSTEM

by

Gwendolyn B. Howze

ABSTRACT

Rats of the weight range 412 to 496 grams and 135 days old were injected with hydroxyurea (HU) inorder to inhibit DNA synthesis in "S"phase cells and to block cells in the"G1"/"S"transition. Preosteoblasts synthesize DNA on the pathway to becoming osteoblast. Preosteoblast should therefore be caught in the HU "net". If HU inhibits osteoblast formation through inhibition of DNA synthesis by preosteoblast the indirect effect should be inhibition of bone formation (osteogenesis).

Histology and light microscopy were used to assay the cytological effects. Labeling with the fluorochromes,tetracycline, calcein, xylenol orange, and histomorphometry were used to assay the effects upon osteogenesis.

The putative preosteoblast population is identified if there is a conjunction of three conditions: HU treatment, the appearence of an abnormal cell population, and inhibition of labeling as detected by histomorphometry. The inference being that the HU inhibited DNA synthesis in the osteoprogenitors,thereby preventing them from developing into osteoblast and consequently inhibiting osteogenesis.

The treatment regimen, collection of the specimen and a subset of the histology was completed during the summer research period. All of the histomorphometry and two-thirds of the histological assays remain to be done.

In the histological specimens which have been studied a definite cellular effect has be observed. It is not possible to correlate the cellular effect with the effect on osteogenesis because the histomorphometry has not been done.

Non - Local Turbulance Theories

by

MAYER HUMI

ABSTRACT

We show that nonlocal models for turbulance similar to transilient turbulance theory (T3) can be derived by the application of Leonard's filter to the appropriate flow equations. The numerical simulation of scalar dispersion in one dimension using this nonlocal formulation is carried out. Furthermore we examine the relationship between K-theory and T3 and obtain restrictions and relations between their parameters. The application of these models for the prediction of clear air turbulance and its effect on aircrafts is in progress.

LEACHING AND HYDROLYSIS

OF SOME

CHLORINATED SOLVENTS

by

PETER M. JEFFERS

ABSTRACT

Rapid Runway Repair material, PERCOL S-100, was evaluated to determine if its use and/or disposal poses any significant environmental hazard. Perchloroethylene does leach from PERCOL S-100 into water to a potentially alarming extent.

High temperature hydrolysis measurements were performed with carbon tetrachloride, trichloroethylene, and perchloroethylene from pH 2 - 12 and 100° C - 170° C. Under these conditions perchloroethylene remains essentially inert while TCE is reactive under basic conditions, and CCl_4 reacts regardless of pH. The data allow extrapolation to neutral, room temperature conditions with predicted half lives of 2.6 years for CCl_4 and 4.4×10^5 years for TCE.

CHOLESTERIC LIQUID CRYSTALS OF BIOMOLECULES

FOR USE AS OPTICAL FILTERS

by

Gordon O. Johnson

ABSTRACT

The biomolecule poly-γ-benzyl-L-glutamate (PBLG), a long chain polymer with a helical backbone, forms cholesteric liquid crystals above certain minimum concentration levels in various solvents at room temperature. Solutions of 10%-40% PBLG (by weight) in dioxane were studied using a polarizing microscope in the visible spectrum and an infrared spectrophotometer. The presence of the cholesteric phase was verified by observation of the characteristic Grandjean structure in these solutions, and the helical period of the cholesteric structure was determined. This period decreased as the concentration of PBLG increased, essentially varying as the inverse square of the concentration. For most optical filter applications the PBLG molecules should lie in planes parallel to the substrate. Lightly etching glass substrates in hydrofluoric acid is found to enhance this alignment. Theoretically when light is normally incident on a layer of such a cholesteric liquid crystal structure, a strong reflection will occur when the wavelength in the material is equal to the period of the cholesteric helix. No such reflection has been seen with the spectrophotometer indicating that better alignment of the molecules must be achieved.

Contribution of the Value Assignment Problem to the Complexity of Test Generation in Combinational Logic Circuits

and

Power Line Testing of CMOS Digital Logic Circuits

by

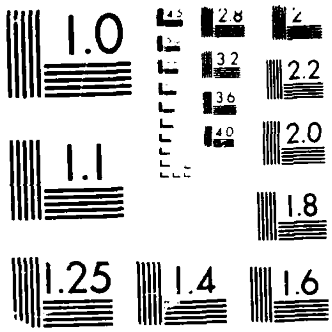
Dr. Louis G. Johnson

ABSTRACT

The effects of reconvergent fanout loops in combinational logic networks were determined for the value assignment problem which underlies most test generation methods. Simple rules were derived for the implication constraints imposed by reconvergent fanout loops to give the complete implications of any single value assignment in a general combinational logic circuit with an arbitrarily complex interconnect of fanout loops. The results show that the complexity of the value assignment problem is proportional to the number of reconvergent fanout loops in the circuit which can be exponential in the number of circuit nodes.

An exploration was conducted into the feasibility of [illegible] digital CMOS integrated circuits through the use of excess [illegible] current in the power line inputs. A circuit design [illegible] multiple power inputs was discovered that allows power [illegible] be used for dynamic CMOS circuits.

AD-A191 120 UNITED STATES AIR FORCE SUMMER FACULTY RESEARCH PROGRAM 4/4
(1987) PROGRAM MA (U) UNIVERSAL ENERGY SYSTEMS INC
DAYTON OH R C DARRAH ET AL DEC 87 AFOSR-TR-88-0211
UNCLASSIFIED F49620-85-C-0015 F/G 5/1 NL



MICROCOPY RESOLUTION TEST CHART

NATIONAL BUREAU OF STANDARDS 1963-A

Effect of Stacking Sequence Upon Delamination Fracture Toughness

by

Dr. William M. Jordan

ABSTRACT

The effect of stacking sequence upon delamination fracture toughness was examined for the relatively brittle AS4/3501-6 graphite/epoxy and for the relatively ductile AS4/APC2 (peek) graphite/thermoplastic. For both systems quasi-isotropic laminates were examined. The difference in stacking sequence related to the degree of slicing that occurred. A different number of plies of the same angle were grouped together in each layup. (Grouping either 1, 2, 3, 4, or 6 plies of the same orientation together). The most spliced system (no grouping of same orientation plies together) had the largest mode I and mode II delamination fracture toughness.

In a second phase of the project, the effect of voids on the delamination fracture toughness of AS4/3501-6 was examined. The voids were introduced during curing and occurred at the ply interfaces. Up to 6% voids were found to increase both the mode I and mode II delamination fracture toughness.

In the third phase of the project the effect of prior loading history on delamination fracture toughness was examined for both the AS4/3501-6 and AS4/APC2 systems. Previous mode II crack extension was found to increase the subsequent mode I delamination fracture toughness. Previous mode I crack extension increased the subsequent mode II fracture toughness.

"GENERIC" CREDIT CARD FEASIBILITY STUDY

by

William F. Kauder, Jr., Ph.D.

ABSTRACT

This study documents the results and findings of a project concerning the availability of a "generic" credit card for the United States Air Force to use in simplifying and reducing the cost of procedures used in making small local purchases. It involved contracting a sample of ten banks and lending institutions to request their cooperation in providing this type of card. A "generic" credit card is one issued to a specific organization rather than in the name of an individual. The use of a "generic" credit card to obtain "Wash Post Items" could effect a great savings in Air Force expenditures if procedures could be changed for its incorporation. Some obstacles are evident but are not insurmountable roadblocks inasmuch as five banks and lending institutions have agreed to participate further in achieving this objective.

The author recommends an in-depth study of Time and Methods to determine an accurate estimate of cost saving from the improved procedures. If cost justified, a Model Installations Program test, using the five positive respondents from this "generic" study, should be carried out at Maxwell Air Force Base or at other selected sites in the southeastern United States.

HIGH ENERGY METASTABLE SPECIES IN CRYOGENIC MATRICES:
PREPARATION, PHOTOPHYSICS, AND PHOTOCHEMISTRY

by

John W. Kenney, III

ABSTRACT

A spectrophotometer system based upon an optical multichannel analyzer was set up to monitor the kinetics of cryogenic matrix formation and monitor the kinetic behavior of active metals deposited in both noble gas and reactive matrices. A matrix cell was constructed to perform these experiments and successfully tested. Preliminary matrix formation studies were carried out using xenon and ammonia as the matrix gases. A xenon-sulfur matrix was also prepared and subjected to spectroscopic study.

DEVELOPMENT OF A GEOTECHNICAL CENTRIFUGE FACILITY AT TYNDALL AIR FORCE BASE

by

Yong S. Kim

ABSTRACT

A medium size centrifuge for geotechnical studies was installed in the Air Force Engineering and Services Center (AFESC) at Tyndall Air Force Base. It has been operational since April, 1987. This report describes details of the testing facility, ongoing research projects and scope of future centrifuge model studies.

Emergent Leadership and Team Effectiveness on a Team Resource Allocation Task

by

Charles E. Kimble

ABSTRACT

Team communication patterns on the Team Resource Allocation Problem (TRAP) were evaluated to determine characteristics of leaders and elements of effective team performance. Talking frequencies and durations and types of verbalizations (commands, suggestions, etc.) of team members during TRAP performances were used as indices of leadership. Individual background information and task and setting features were assessed to see how they related to leadership behavior. Team characteristics and communication patterns were related to team performance scores under high and low time pressure to evaluate team effectiveness. Results indicated that teams with computer-experienced members and teams which were given strategies for doing the task performed better. Also, teams with equal verbal participation rather than having one person who dominated talking performed better. Older people, people with computer experience, and men assumed leadership roles by giving suggestions and issuing commands more than others did.

EXPERIMENTAL TESTING OF IMAGING CORRELOGRAPHY

by

Jerome Knopp

and

Brian K. Spielbusch

ABSTRACT

An experimental verification of imaging correlography was completed. A laboratory testbed was set up using a CCD camera to collect speckle data from a diffuse object. The collected data was averaged and processed to estimate the Fourier modulus (FM). The FM was then used to estimate the image of the diffuse object using phase retrieval algorithms. A high quality image was recovered using approximately 1200 frames of speckle data.

A STUDY OF THE ELECTROCHEMICAL BEHAVIOR OF TRIHALIDE IONS CONTAINING BROMINE AND CHLORINE IN MELTS COMPOSED OF ALUMINUM CHLORIDE AND 1-METHYL-3-ETHYLIMIDAZOLIUM CHLORIDE

by

Lawrence F. Koons

ABSTRACT

Cyclic voltammetry was used to study the properties of trihalide ions in the title system. The formation constant of the tribromide ion was estimated to be of the order of 1000. The chloride ion exchanges with bromide ion on the tribromide ion to form the dibromomonochloride ion. The tribromide ion is oxidized at a potential more positive than is bromine ion; it is reduced at a potential more negative than is bromine. The reduction of the tribromide ion at tungsten electrodes may occur through an intermediate with a lifetime of the order of seconds. The tribromide ion and Br_2Cl^- are oxidized at approximately the same potential and they are reduced at approximately the same potential. The Cl_2Br^- ion is oxidized at approximately the same potential as is the chloride ion. It is reduced at a potential 0.2 V more positive than is the Br_3^- ion.

SEMIEMPIRICAL CALCULATIONS OF NON-LINEAR OPTICAL PROPERTIES

by

Dr. Henry A. Kurtz

ABSTRACT

The MOPAC semiempirical electronic structure program was modified to calculate the polarizability and first and second hyperpolarizabilites for molecules. A finite field approach was used based on both energy and induced dipole expansion. Test calculations where done on a series of mono- and di-substituted benzenes.

Mathematical Removal of Low Frequency Fluctuations

From Experimental LDV Data

by

Thomas R. Lalk

ABSTRACT

A computer software technique for identifying and removing low frequency fluctuating components from LDV velocity measurements was developed and verified. The velocity realizations from the LDV measurement of turbulent flow velocities in an experimental model of a dump combustor were stored on magnetic tape and constant time interval sampled to provide a secondary data set for Fourier analysis. A fast Fourier transform algorithm was used to transform the data set to the frequency domain where identification and removal of dominant frequencies was accomplished. The remaining data was inverse transformed to the time domain resulting in a data set devoid of the removed frequencies. The technique was tested by analyzing functions of known frequency content and actual LDV data for which the frequency content had been determined with an electronic analyzer. It was determined that the software technique functioned as intended.

CONSTRUCTION AND PRELIMINARY VALIDATION OF AN EQUAL OPPORTUNITY CLIMATE ASSESSMENT INSTRUMENT

by

Dan Landis, Ph.D.
and
Gloria Fisher, M.Ed., M.S.

ABSTRACT

Construction and preliminary validation of an instrument to assess equal opportunity climate in the military was begun. The research was conducted at the Defense Equal Opportunity Management Institute (DEOMI) at Patrick Air Force Base, FL. Students who are undergoing equal opportunity training at the institute served as subjects. A definition of equal opportunity climate is provided. A model linking equal opportunity climate to other organizational variables is also presented. Preliminary results in the development of the assessment instrument indicate that it is reliable and has some measure of construct validity. Further laboratory research and field validation among a random selection of military bases are recommended.

A Hyperbolic Interpolation Algorithm for Modelling Radiance Data and Exponential Inversion

by

Steven J. Leon

ABSTRACT

Transfer theory relates the upwelling intensity to the integral transform of the Planck intensity B(t). Radiance values can be obtained by remote sensing from satellites. In order to recover the Planck intensity from the data one must solve an integral equation of the first kind. Such equations are notoriously ill-posed and consequently difficult to solve in a numerically stable manner. If one assumes an exponential model for B(t), then it follows that the radiance data should be represented as a rational function. Jean I. F. King has proposed an algorithm for a rational interpolation of the radiance data at 2n points. The Planck intensity can then be reconstructed analytically using the coefficients and weights of the interpolating function. In this paper we develop and test the interpolating algorithm. We also develop software for reconstructing the Planck intensity and discuss the stability of the inversion. Significant errors in the data will cause one of the components of the interpolating function to have a positive pole. The algorithm has been designed to detect this situation and then locate and correct those points which are in error. Thus the algorithm can be used to detect and compensate for a faulty sensing channel.

Experimental Protocols for Investigating the Physiology of Orthostatic Intolerance in Humans

by

David A. Ludwig

ABSTRACT

Orthostatic intolerance is associated with the inability of cardiovascular reflexes to maintain arterial pressure and can be manifested by the onset of presyncopal symptoms or syncope during exposure to hydrostatic stress in the head:foot ($+G_z$) direction. Two experimental protocols are presented to further study the physiology of this condition. It is hoped that the data from these two investigations will allow for a more complete understanding or orthostatic intolerance in humans. At this point, the relative contribution of venous compliance and arterial pressure have not been demonstrated.

EFFECT OF REPEATED LOW DOSE SOMAN ON ACETYLCHOLINESTERASE ACTIVITY

By

MOHAMMED A. MALEQUE, PH.D.
Antoinne Able, Otis Cosby, Jr.

ABSTRACT

Acetylcholinesterase activity was measured in rodents during repeated low dose soman exposure and following the cessation of exposure by spectrophotomeric and radioisotopic methods. A repeated single dose of soman (39.0 ug/kg., s.c.) inhibited the acetylcholinesterase activity both in rat blood serum and brain hippocampus and amygdala. However, the degree of inhibition varied from one tissue to another. Similarly to the differential inhibition, recovery of the enzyme activity was also observed following the cessation of soman exposure over a 5 day period. This research was conducted as part of a larger study which is attempting to measure the effect of repeated soman on biochemistry, neurohistology, and performance in either the same subjects or in subjects matched for soman poisoning. The study will provide a unique opportunity to obtain neurochemical information concurrently with information on neurohistological changes and performance.

DISPOSAL OF CHEMOTHERAPEUTIC WASTES

by

Robert E. Masingale, Sr.

ABSTRACT

Air Force medical facilities are generating chemotherapeutic wastes from care and treatment of oncologic cases. Proper disposal of these wastes are dependent upon guidelines that are currently insufficient or nonexistent. A survey reveals that the majority of Air Force medical facilities generated a small quantity of chemotherapeutic waste and that less than 5% of Air Force medical facilities were responsible for the majority of the chemotherapeutic wastes. Many facilities are disposing their chemotherapeutic waste in pathological incinerators. This study focused on exploring chemical deactivation and incineration as disposal methods. Chemical deactivation was explored as an alternate means for facilities with limited access to cost-effective disposal systems. Incineration was also investigated because it was stated to be the disposal method of choice.

Assessing Costs and Benefits of Personnel Research:

Application of Utility Concepts to Military Programs

by

Michael D. Matthews

ABSTRACT

A major problem in the manpower and personnel research community is the transfer of technology from the laboratory to operational settings. One solution to this problem involves translating arcane statistical findings into economically meaningful statements. Utility analysis is one way of accomplishing this translation. The purpose of the current report is to critically review recent developments in utility analysis and to assess how applicable these developments are to military manpower and personnel research programs. Illustrative examples of the application of utility models to ongoing Air Force personnel research projects are given. Recommendations are made for what variables are and are not critical in applying utility analysis to military research programs.

Investigation of new luminescent rebroadcasting devices for optical information processing

by

Dr. Alastair D. McAulay

ABSTRACT

Preliminary experiments were performed to characterize thick and thin film samples of a new luminescent rebroadcasting device. Results are limited by the equipment used and show resolutions to 50 line pairs per inch, read speeds to 5 kHz, and write speeds to 0.3 kHz. Clearing the device takes longer. Methods of performing basic processing functions were developed including analog addition and multiplication and the 16 Boolean logic operations. Some results are presented. Optical information processing schemes most suitable for the new devices are discussed including: analog matrix-vector multiplication for probabilistic expert systems and neural networks, symbolic substitution, interconnection networks, and analog to digital conversion.

Automated Extraction of Knowledge-Base Object Tuples

From Domain Documents

by

Dr. Barry A. McConnell, CDP

ABSTRACT

This study examined the use of automated semantic extraction of object-attribute-value (OAV) tuples from domain specific documents. Using techniques of natural language processing coupled with expert heuristics, the system is designed to identify objects of interest to a particular expert system domain and extract specific values for those objects by a semantic analysis of free-form text contained in domain documents. Attribute identification and value validation is accomplished with a worlds model database of potential OAVs developed for global concepts, and expanded with each application in a new domain. At present, this project has reached the stage of implementing a robust DCG which is functionally oriented towards object identification.

AUTOMATED DESIGN OF LARGE-SCALED FRAME STRUCTURES WITH MULTIPLE FREQUENCY CONSTRAINTS

by

Oliver G. McGee

ABSTRACT

Automated design of large-scaled frame structures for dynamic behavior using the optimality criteria (OC) method, typically involves structural members with rectangular or I-sections undergoing extensional plus flexural action. Since the response is primarily governed by a principal moment of inertia, it is considered as the primary design variable and crossectional area as the secondary one. The thrust of this research effort was to formulate both design variable scaling procedures and member resizing relations. Developed formulae shows that the scaling procedure in conjunction with the finite element analysis of planar frame structures are both efficient and promising for future applications towards optimization of large-scaled frames using the OC method.

Statistical Methodology for Assessing Group Health Differences

by
Daniel Mihalko

ABSTRACT

Three major tasks were addressed: (1) Develop statistical methodology for analyzing mortality/morbidity data which involves periodic physical exam information; (2) Odds ratio estimation in the presence of three-factor interaction or confounding; (3) Estimation of half-life of blood dioxin level.

In task (1) we extended the survival/sacrifice literature by using a logistic model to adapt the estimation techniques of Dinse (1982) to include the comparison of two groups via relative risk. We also began investigating models which relate disease incidence, prevalence, mortality rates and survival experience.

In task (2) we developed and tested a method for estimating two factor association in the presence of a third factor. The resulting estimator uses statistical pretests to determine three-factor and two-factor interactions. A simulation study shows that this procedure reduces bias and mean square error over the crude collapsed estimator.

In task (3) we investigated introducing lab error with a specified coefficient of variance into the exponential decay model. We built likelihoods for two different such models in an attempt to estimate the half-life of the decay curve using only two points measured with error.

A Comparison of Tracking with Active Stick Controllers with an Optimal Control model

Augustus Morris

Abstract

Active stick controllers are unique from traditional passive controllers by providing additional feedback to the human by means of an active force applied to the stick. A certain empirical relationship has been found using an active controller, in previous studies, which allows greater tracking performance than tracking with passive controllers.

An optimal control model was developed to compare with a previous experiment in which a total of twelve conditions were tracked. It was found that the experimental results matched the optimal solutions when the product of the plant and active loop resembled McRuer's crossover model. However, the best performance scores were found experimentally when the active loop had dynamics of S. It was theoretically shown that when the active loop was S, regardless of the plant, the system would still behave functionally as an optimal system.

Examination of the Point Spread Function in the RETINAL THERMAL MODEL

by

Mary L. Morton-Gibson

ABSTRACT

The RETINAL THERMAL MODEL was originally developed for the Air Force in the early 1970's. It was designed to be used to predict retinal damage due to LASER assault. In the summer of 1986, the model was examined extensively. The basic equations and assumptions used in developing the model, the values of the constants used and the method of solution were determined (Morton-Gibson, 1986). At that time a number of recommendations were made for changes to the model. Two of those recommendations are addressed in this report.

1)Recently a limited set of experimental threshold data for multiple pulses became available (Zuclich, unpublished results). The threshold prediction of the model was compared to those data. The model predictions and the experimental data show the same general form but the model predictions are consistently slightly lower than the experimental data.

2)The RETINAL THERMAL MODEL predicts an eccentric retinal irradiance profile for both uniform and Guassian corneal profiles. The summation of the images of each of the points that constitute the incident beam should produce an approximately bell-shaped profile. A recently developed point-spread function was therefore examined. Polhamus, et al (1986) used double precision and a Gaussian quadrature scheme to perform the numerical integration.Their retinal profiles for a uniform incident beam do not show the off-center peak shown by the RETINAL THERMAL MODEL. Since their numerical solution appears to solve at least some of the problems inherent in the original model, that solution was incorporated into the RETINAL THERMAL MODEL.

DEVELOPING MODELS FOR EMPIRICAL RESEARCH ON WOMEN IN THE MILITARY

by

Lena Wright Myers, Ph.D.

ABSTRACT

The primary objective of the research effort was to develop an empirical research design to examine role performance of women in the military. The researcher assumed that, theoretically, self-investment in work leads to commitment to the occupational role based on the relevance of work to self-esteem. The major variables identified for follow-on research were occupational and organizational commitments and self-esteem. The initial process by which the objectives for this project were achieved involved an in-depth search of literature with a similar focus. The process added impetus to the need for developing the research model titled: Occupational and Organizational Commitments of Women in the Military.

MULTI-MODE SENSING IN AIR-TO-AIR MISSILES

by

James Bert Nail

ABSTRACT

Multi-Mode guidance is the application of redundant sensors to improve missile specifications, enhance all-weather capability, and provide reliable operation despite countermeasures. The complexity of dual seekers can be self-defeating due to maintenance, reliability, and economics. This research atempts to define a sensor combination that is synergistic and feasible, then investigates the design constraints to extract specifications. The emphasis is on design for compatibility, reliability, and economy, mindful of the fact that most missiles are shot down by lack of funding. Recent advances in pyroelectric films are presented, and a simple pyroelectric sensor proposed.

NIGHT-TIME CO_2(001) VIBRATIONAL TEMPERATURES AND LIMB-VIEW INTEGRATED RADIANCES IN THE 50 TO 150 KM ALTITUDE RANGE

by

Henry Nebel

ABSTRACT

Night-time vibrational temperature profiles as functions of altitude have been obtained for the (001) state of carbon dioxide using a line-by-line infrared radiance code developed at the Air Force Geophysics Laboratory (AFGL). The calculation assumes absorption of earthshine and airglow, collisional interaction with N_2, O_2, and O, and spontaneous emission. Results are presented for the principal isotopic form $^{12}C^{16}O_2$ as well as for the less abundant forms $^{13}C^{16}O_2$, $^{16}O^{12}C^{17}O$, and $^{16}O^{12}C^{18}O$. The resulting profiles are used to calculate infrared radiance from the 4.3 micron (ν_3) band of CO_2 through the atmosphere in a limb-viewing geometry. This has been done for the four isotopic forms indicated above in the fundamental band and also for selected higher order transitions. The resulting radiance is compared with data from the Spectral Infrared Rocket Experiment (Stair, et. al., 1985). Recommendations are made for resolving the discrepancies observed.

A Kinetic Study of Thermal Decomposition of TNT by High Performance Liquid Chromatography

by

Maurice C. Neveu

Abstract

Thermal decomposition of TNT was carried out at 240°C. The amount of unreacted TNT as a function of time was measured isocratically in 70% methanol/water by high performance liquid. A plot of percent reaction against time resulted in a sigmoid type of curve in which the extent of reaction increased slowly up to 120 minutes and then increased rapidly. This indicates autocatalysis whereby product formed during the reaction catalyzes further reaction.

Evaluating Expert Systems

by

James L. Noyes

ABSTRACT

The evaluation of artificial intelligence (AI) expert systems involves additional considerations over that of conventional software evaluation. Some of these relate to the evaluation of the knowledge base with respect to consistency, completeness and quality of information that is provided by the experts. Other considerations relate to the expert system software itself. This report addresses the traditional software engineering aspects, but focuses upon the issues that relate to expert systems in particular. These issues are identified and discussed. An expert system evaluation strategy is presented together with the identification of some software tools and methodologies to aid in this evaluation.

Isolation of Osteoprogenitor Cells from the Trauma-Activated Periosteum

by

Noel S. Nussbaum

ABSTRACT

Closed green-stick rib fractures were produced, by manual pressure, in anaesthetized white New Zealand male rabbits. After 5 days of healing, the enlarged periosteum of the fracture site was collected and subdivided, by sequential collagenase-trypsin digestion, into primary cell cultures. Semi-defined media (BGJ_b, Gibco) supplemented with hydrocortisone and insulin, was used to maintain these non-transformed cells for up to three weeks. Similar cultures were prepared from embryonic chick calvariae. Alkaline phosphatase and glycosaminoglycan secretion into the media was monitored and comparison of data derived from the two species supports the osteogenic identity of the cells isolated from the rabbit periosteum.

Assessing the Attributes of Expert Judgment: Measuring Bias in Subjective Uncertainty Estimates

by

Thomas E. Nygren

ABSTRACT

It is argued that if our goal is to train individuals to become expert decision makers, regardless of the context of the judgment, it is of paramount importance to understand how non-experts and experts represent uncertainties as subjective probabilities. This paper reports the results of a study that examined the role of the subjective probability function in models of human decision making. Specifically, the study examined the possibility of a dual probability function model similar to that formally proposed by Luce and Narens (1985) and introduced for attractiveness ratings of gambles by Nygren (1981). Results of the study indicated that when subjects were asked to make judgments about risky alternatives, there was a significant trend to give a different estimate or weight to the same probability value in a choice situation when it was associated with the less attractive outcome than when associated with the more attractive outcome. The implications of these biasing effects are discussed in relation to (a) situations where "good" and "bad" outcomes can differentially affect judged probabilities or probability weights and to (b) the study of expert judgment.

ON THE GENERAL EXISTENCE OF PRECURSOR FIELDS IN A CAUSALLY DISPERSIVE MEDIUM

by

Kurt Edmund Oughstun

ABSTRACT

A set of conditions on the medium properties under which the Sommerfeld and Brillouin precursor fields can evolve under proper field excitation in a general causal, temporally dispersive medium is obtained. These conditions for the existence of the precursor fields are derived from the asymptotic description of the dynamical field evolution in the dispersive medium due to a given input pulsed electromagnetic field. The only description of the medium employed is that it satisfies the Kramers-Kronig relations. The analysis also provides the requirements on the initial pulse rise-time that are necessary for these precursor fields to be excited in the host medium.

ESTIMATION OF SPECTRAL DENSITY BY RANDOM SAMPLES

by

Surgounda A. Patil

ABSTRACT

A conditional distribution of the waiting times was utilized to obtain in an ordered random sampling plan and the waiting time relations were used to produce a random sampling plan when the point process followed a Poisson process. A sinusoidal wave process was generated and the process was sampled according to the periodic plan and the random sampling plans. The estimators of the mean velocity, autocorrelation function and spectral density function were defined under each of the sampling plans for a given process. The estimates of these quantities were computed for the simulated sinusoidal wave. The graphs of the autocorrelation function and the spectral density function were presented. The estimators and algorithms for the autocorrelation function and spectral density function for a randomly sampled process were searched in the literature. Among these, the estimators and algorithms which were applicable to randomly arriving data like velocimetry data were identified. An outline of the procedures for these estimators was presented in a usuable form.

Computer Skeleton Program Generator

by

Martin A. Patt

ABSTRACT

A skeleton program generator was adapted for use at AFGL. The generator prepares source program text in any of six popular computer languages.

A SUBOPTIMAL FEEDBACK CONTROL FOR WING ROCK

by

William N. Patten

ABSTRACT

An online, suboptimal feedback control strategy is developed for a swept wing aircraft attempting maneuvers at a high angle of attack. A causal model of the aircrafts characteristics that was developed on the basis of free-to-roll wind tunnel experiments, and high order numerical modeling using recent advances in the vortex lattice method.

The control analysis is developed using a weak variational formulation of the classical optimal control problem applied to the nonlinear high angle of attack aerodynamic problem. Quasilinearization, and the finite element method, are combined with a rational feedback procedure to produce an algorithm implementable on a personal computer architecture.

Release of Dynorphin B From

Mossy Fiber Synaptosomes

by

Ralph I. Peters

ABSTRACT

The mossy fiber system of the hippocampal formation of the mammalian brain has previously been shown to exhibit immunoreactivity to dynorphin B, a recently identified peptide classified as an endogenous opiate. It is reported here that mossy fiber synaptosomes spontaneously release dynorphin B, and that additional release may be evoked by depolarizing the synaptosomes with potassium ion. The evoked release increased linearly between 30 and 75 mM potassium. One minute of superfusion with elevated potassium was sufficient to evoke release, although two and four minutes of superfusion evoked greater and nearly equivalent release. The release of dynorphin B from these synaptosomes was found to be highly calcium dependent, and was reduced by 36% in the presence of 10 uM 2-chloroadenosine.

MOMENTUM TRANSFER AND MASS LOSS FOR A C.W. LASER IRRADIATED TARGET

by

Randall D. Peters

ABSTRACT

An experiment is proposed for determining the amount of momentum that can be imparted to a target by means of continuous laser irradiation. Because photon momentum is for most purposes insignificant, the experiment is primarily concerned with intensities above the threshold for state change accompanied by mass loss. To better understand the physics of the interaction, the time dependence of both applied force and mass loss are required. A single instrument in the form of a torsional pendulum fitted with a differential capacitive transducer is proposed to perform the real time measurements necessary to obtain the required time histories. This instrument appears to have unique diagnostic capabilities, and detailed analyses show that it should be able to satisfy all system requirements.

Raman Spectrum of Acetanilide

by

Gerald L. Pollack

ABSTRACT

The purpose of this project was to examine the Raman spectrum of acetanilide (ACN). A particular goal was to look for frequency shifts of about 1650 wave numbers, which may be associated with hydrogen-bond chains. All spectra were taken on a Varian triple-grating Raman spectrometer in the laboratory of Dr. J. Taboada at USAFSAM; an argon-ion laser was the light source. Spectra were taken of solid acetanilide in several forms: viz. polycrystals grown from methanol solution, from acetone solution, and from chloroform solution, and also compressed pellets. Several interesting spectral features were observed. However, in order to clearly observe the postulated soliton evidence one must make measurements at lower temperatures, say near 77K. Such measurements are now underway and more are planned for the future.

X-ray Diffraction by Superconducting Oxides

by

Spencer K. Porter

ABSTRACT

In just the past eighteen months there has been an explosion of interest in a new class of complex copper oxides that show superconductivity at temperatures as high as 95 K. An important part of studying these materials is determining the structure and bonding in them. As work has progressed the possibility that the valence electrons, especially those in orbitals of copper atoms, play a key role in superconduction has become stronger. My work had the goal of developing methods for accurate measurements of unit-cell constants and this has been achieved for crystals with cubic symmetry. Extensions of the method to crystals of lower symmetry have been developed but not tested. Studies were made of GaAs, which is cubic, and a number of superconducting samples. The patterns from the latter were shown to be similar to those reported in the recent literature. The patterns also showed a high background indicating poor crystallinity.

A New Sensitive Fluorometric Method for the Analysis of Submicrogram Quantities of Cholesterol

by

Dr. Leonard Price and Conrad Murray

ABSTRACT

Two fluorescent compounds, 3-chloroformyl-7-methoxycoumarin (3-CMC), and 7-dimethylamino-1-naphthaline sulfonyl chloride (dansyl chloride) were studied as possible derivatizing agents for the analysis of submicrogram or trace levels of cholesterol. 3-CMC was synthesized and its yield, melting point, and chromatographic properties determined. Reaction conditions for the preparation of the fluorescent cholesterol ester of 3-CMC were established. Dansyl chloride did not react with cholesterol. 3-CMC provided good sensitivity for the detection of cholesterol. This method should permit the analysis of cholesterol in small serum samples or in biological fluids where cholesterol concentrations are very low.

A MODEL SYSTEM FOR EXAMINING MACROPHAGE-LYMPHOCYTE INTERACTIONS

by

Stephen B. Pruett

A model system consisting of co-cultures of various cell types along with the thiol-dependent CTLL-2 lymphocyte cell line was developed. This system is representative of the thiol dependence of normal lymphocytes whose requirements can be supplied by thiols produced by macrophages present in most lymphocyte cultures. It was demonstrated that thiol production and not some macrophage-specific function is the basis for support of CTLL-2 growth by various cell lines. Evidence was obtained suggesting a relationship between production of toxic forms of oxygen by macrophage- like cells and their production of thiols and ability to support CTLL-2 cell growth. With appropriate adaptation this system could be used to investigate the effects of microwave radiation or other agents on this aspect of macrophage-lymphocyte cooperation.

DIGITAL OPTICAL COMPUTING

POTENTIALS AND PROBLEMS

By

P. A. Ramamoorthy

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ABSTRACT

Air Force is interested in rapid advances in digital optical computing to meet the processing needs of future weapons systems. Optical computing has been identified as a candidate since it seems to offer certain potentials and at the same time there is a feeling that improvement in the speed of electronic digital computing will at best be marginal. In this paper, we take a critical look at digital optical computing, outline the possible benefits from optics, the problems we face today and make some suggestions for future directions to make digital optical computing really viable and compete with a well entrenched technology such as electronic digital computing.

A Critical Review of Some Recent Remotely Sensed Studies of Typhoons in the North West Pacific

by

Gandikota V. Rao

ABSTRACT

Recent studies of tropical cyclones, in particular typhoons, were reviewed. Those studies that used satellite sensing were singled out. Some sensors gave visible and IR imagery thus facilitating a view of the cyclones in various stages. The equivalent black body temperatures of the cloud tops of the cyclones revealed very cold regions and their appearance was suggested as an indication of the development process. The radiation from the water vapor channel (6.7 micron) revealed certain features which seemed to have influenced the future curving of certain cyclone tracks.

The SEASAT (1978) observations covered only a span of four months but gave certain unique details of the typhoons. In general the satellite derived wind speeds were underestimated as were the rain amounts in the cyclone core area. The remotely sensed vertical structure of the cyclone environment through TIROS-N proved useful in predicting the movement with a statistical model.

A recently launched (June 1987) DMSP satellite is sending microwave data currently. In particular the SSM/T and SSM/I microwave data of typhoons would reveal various features such as wind speed and rainfall so far unavailable through remote sensing.

Ambiguity and Probabilistic Inference in a

Missile Warning Officer Task

by

Donald U. Robertson

ABSTRACT

Two models of the influence of ambiguity on probabilistic inference were applied to judgments of the probability that simulated sensor system data represents an attack. The SIMCOPE simulation was modified and three studies were conducted. Analysis of aggregate and individual data supported a revision of the Einhorn-Hogarth ambiguity model. Application of both models to the missile warning task indicated that (a) beliefs engendered by readiness state and intelligence reports about launch sites have a major impact on judged probability of attack and the relative influence of these contextual factors is reflected in model parameters; (b) people are sufficiently regressive in their judgments when given unreliable or ambiguous information; (c) model parameters are indicative of reliable individual differences in judgment/decision making; and (d) parameter estimates from single cue models can be used to predict accurately judgments in multiple cue scenarios. Models of probabilistic inference which incorporate ambiguity may be useful in identifying potential sources of judgmental error and in providing a

model of human judgment necessary for development of adaptive decision aids.

A TEST CHIP FOR CHARACTERIZATION OF MBE EPITAXIAL LAYERS FOR NOVEL DEVICE APPLICATIONS

by

Kenneth P. Roenker and Kevin P. Cahill

ABSTRACT

A custom test chip has been designed containing some 71 individual transistors, test structures and circuits for the purpose of aiding the demonstration and development of novel semiconductor transistor designs employing multiple molecular beam epitaxial (MBE) layers similar to the heterojunction bipolar transistor. In particular the test chip was designed to assist in the development of the inversion base transistor (IBT) and the bipolar inversion channel field-effect transistor (BICFET). Utilizing the same multi-layer MBE substrate and fabrication process employed in the construction of the novel transistor of interest, the use of the test chip's mask set results in the fabrication of a set of twelve transistors of various sizes and geometries, a number of basic devices and test structures, and a few simple circuits. Since these structures are composed of the same epitaxial layers, contain the same interfaces between materials and are fabricated using the same process; electrical measurements of these structures can provide information on layer properties, interfacial quality, fabrication process results and device physics. These data can provide insight into fabrication difficulties and experimental phenomena that may limit transistor action or performance. This report provides a brief summary of each test structure, its construction and its electrical characterization. A more detailed description of each test structure, its critical dimensions and operation is available in a separate document. References are provided for further study of each test structure's utility.

Heat Removal from High Heat Flux/Large Area Surfaces by Single-Phase and Two-Phase Flow of Water

by

Ramendra P. Roy

ABSTRACT

Several techniques for efficient heat removal from high heat flux/large area surfaces have been suggested in the past and a few have been studied. In this study, heat removal by forced convection to water is looked at in some detail. Either all-liquid flow along the entire coolant path or subcooled nucleate boiling along a portion of the path are possibilities, the latter being the more efficient heat transfer process. The water flow may be straight (axial) or with a swirl (rotation) component superposed on the base axial flow. It is shown that the combination of subcooled nucleate boiling heat transfer and swirl flow of water at a high mass flux is the most desirable among the techniques considered in so far as prevention of the occurrence of critical heat flux condition and consequent damage to the heated surface is concerned.

Dr. Paul Rybski

Late Appointment

No Abstract Submitted

At This Time

Three-Dimensional Finite Element Program

by Joseph E. Saliba

ABSTRACT

Prior to this effort, the University of Dayton developed a theoretical approach and an associated two-dimensional computer program for predicting aircraft tire sinkage and resulting rut depths on layered soil surfaces. This elastic/viscoplastic, finite element technique holds exceptional promise for significantly improving ability to model the performance of airfield surfaces during aircraft ground operation and to achieve accurate, reliable ability to predict aircraft ground operation. The Fiscal Year (FY) 1987 Summer Faculty Research Program (SFRP) effort's objective was to increase the analysis method's capability by providing ability to predict tire sinkage and resulting airfield surface rut depths from aircraft maneuvers, such as turning, that are three-dimensional problems. University of Dayton's theoretical elastic/viscoplastic approach was applied in the development of a three-dimensional nonlinear finite element computer program for predicting tire sinkage and airfield rut depth on layered airfield surfaces. This FY87 SFRP developed three-dimensional and previously developed two-dimensional finite element programs are powerful tools. They are needed for reliable, accurate evaluation and establishment of existing aircraft and airfields' performance capability, and for studying and evaluating new aircraft and airfield surface concepts. New capability is provided to investigate performance over a wide range of conditions. Application of these computer programs will have a significant impact on reducing the time needed and costs incurred for resolving existing problems and developing new concepts. For example, the number and scope of laboratory test track, load cart, or aircraft tests needed to obtain data or validate concepts will be significantly decreased.

A CASE FOR NEURAL NETWORKS

by

Richard M. Schori

ABSTRACT

Neural networks or neurocomputers are parallel computers whose designs are based on simplified versions of the human brain. In this paper I discuss why certain types of problems can be better solved with neural networks than with traditional Artificial Intelligence (AI). This is done by stepping back from the details of neural networks and AI and evaluating the scientific paradigms (philosophy) behind these ideas. The notion of the symbolic paradigm, which is associated with AI, is compared with the emerging subsymbolic paradigm, which is associated with neural networks. Another implementation of the subsymbolic paradigm by Transform Index Technologies, Inc. is also discussed and compared with neural networks. The author feels that an understanding of these subjects at this level is crucial in making any decisions on these topics.

I also discuss the theory that information is stored in the human brain as a hologram and we relate this to associative or content-addressable memories. The essence of intelligence is discussed and this along with associative memories is tied in with fractals, chaos, and neural networks. Finally, there is a discussion of a potential connection with some mathematics research results of the author.

FRACTURE IN DAMAGED MEDIA: AN INHOMOGENEOUS MATERIAL APPROACH

by

Lawrence Schovanec

ABSTRACT

To model the effects of damage near a crack tip in a linear elastic isotropic medium, material inhomogeneity is introduced by assuming a spatially varying shear modulus. Two particular models are considered. A piecewise constant shear modulus is adopted to model damage confined to wedge-shaped regions ahead of the crack. A continuously varying modulus corresponding to a softening of material surrounding the crack tip is also considered. In both instances expressions for the stress and displacement fields are derived. A qualitative and numerical analysis of the effects of material inhomogeneity upon the crack tip stress singularity and crack opening displacement is presented. The implications of these results with regard to crack propagation are investigated.

Characterization of Fire Training Facility Wastewater

by

William D. Schulz

ABSTRACT

Live fire training is a necessary Air Force activity, but the wastewater produced in training exercises creates environmental problems. The wastewater contains soluble components of excess JP-4 fuel and of aqueous film-forming foam (AFFF); both are detrimental to wastewater treatment systems. AFFF was found to be a serious interference in analysis of JP-4 in wastewater. AFFF is an extremely effective fire suppresant consisting of several surfactants and 2-(2-butoxyethoxy) ethanol ("butyl carbitol") solubilizing agent. AFFF reduces or prevents recovery of liquid-liquid extractants and alters the solubility of internal standards. The effects are not linear with AFFF concentration. Solid phase extraction (SPE) cartridges were used for concentration and cleanup of environmental and laboratory samples. The SPE technique removed interferences and resulted in increased fuel component recovery. SPE concentration resulted in detectable levels of alkanes through tetradecane, whereas only aromatic compounds have previously been reported at retention times higher than that of decane. In addition, the separation and concentration observed for AFFF components appear to make SPE an attractive pretreatment for chromatographic analysis of some of the component surfactants.

Leaky Rayleigh Waves On Surfaces With Laminar Microstructure

by

Nisar Shaikh

ABSTRACT

Experimental measurements of leaky Rayleigh waves on a fluid- composite solid interface are presented and the results are compared qualitatively with those of a computational model of mixture-continua. A laminar microstructure is simulated by fabricating a solid from a stack of alternating layers of stainless steel and copper sheets. Leaky Rayleigh waves are propagated in the laminar direction with their particle motion in the plane of the layers. The Rayleigh waves are observed to be dispersive and the frequency dependance is related to the ratio of wave length and layer thickness (cell size). For short wave lengths, the Rayleigh wave velocities asymptotically approach the values for the constituent having the slower surface wave velocity in the absence of microstructure.

Radiation Hypersonic Aerodynamics

by

Shiva N. Singh

Abstract

The USAF Forecast II Initiatives, PT024 in Hypersonic Technology base development requires exploring a research area of interdisciplinary sciences. It is found that the broad front in chemical kinetics for high temperatures has considerably been advanced, but the additional mechanism of energy transfer by radiation at high temperatures is largely unknown and uncertain. This report attempts to present the salient features of the research work done on hypersonic flow problems including the effects of radiative heat transfer mechanism associated with large flight Mach numbers in the range of 5 to 25, high temperature (8000° K) and high altitude (approximately 60 km above ground) conditions. Experimental observations indicate that the hypersonic flow past a plate in a rarefied gas medium, the different flow regimes exist on the surface starting from the free molecular flow, to transition, to the slip-flow and finally to the continuum flow conditions seperated by shock waves. To study the various flow regimes theoretically and/or numerically, two sets of differential equations, the Boltzmann and Navier-Stokes equations including radiative transfer equation are presented and the applicable boundary conditions are discussed. The important dimensionless parameters governing the hypersonic vehicle flight conditions will be given. The related literature is reviewed and finally the topics for further studies are recommended.

ROBUSTNESS AND CONTROL/STRUCTURE DESIGN INTEGRATION FOR FLEXIBLE DYNAMIC SYSTEMS

BY

G.L. SLATER

ABSTRACT

This report covers two topics in the control-structure interaction of large flexible structures. The first of these is the quantification of realistic measures of control robustness for flexible structure design. The results here indicate that standard robustness techniques involving singular value tests of the return difference matrix should be combined with other algebraic tests such as positivity to ensure stability and performance.

A second research topic is the initiation of a technique for combined structure-control optimization. This approach uses the concept of response constraints to form a combined variational approach to total system optimization. For the special case of linear controls and quadratic constraints the problem reduces to a standard LQG problem plus a structure optimization. The method is general however and can be extended to more general problems such as nonlinear controls and slew optimization.

THEORETICAL AND EXPERIMENTAL INVESTIGATIONS

OF ION-POLAR MOLECULE INTERACTIONS

By

Timothy C. Su

ABSTRACT

The method of classical trajectory calculations has been used to calculate low temperature ion-polar molecule capture collision rate constants . The calculated rate constants are very close to the "centrifugal sudden approximation" theory. Trajectory calculations have also been employed to calculate momentum transfer rate constants. The calculated rate constants are higher than experimental results, suggesting that the short range repulsive potential may be important in determining momentum transfer rate constants. A trajectory treatment has also been developed to calculate cluster ion-polar molecule reaction rate constants at low temperatures. This treatment takes into account the importance of the net dipole moment on the cluster ion which is induced by the polar molecule. The results show little change in rate constants. Reaction rate constants for the reactions of F^- with CH_3Cl, CH_3Br and CH_3I, and for the reactions of N_3^- with CH_3Br and CH_3I have been measured in the gas phase using the selected ion flow tube (SIFT) apparatus. Measurements have been done at various temperatures and relative kinetic energies. It was observed that rate constants of all these reactions decrease as temperature increases. In most cases , as the relative kinetic energy increases, there is an initial increase in reaction rate constants.

A BALANCED FIBER OPTIC DISTRIBUTION NETWORK FOR PHASED ARRAY ANTENNAS

David A. Sumberg, Ph.D.

ABSTRACT

A non-interferometric technique is described to measure optical path length differences of a 1 x N fiber optic coupler to a tolerance of less than 150 micrometers. The method compares the phase of an RF modulated light signal in the branches of the coupler with that of a reference branch. Techniques to equalize these path differences are described.

Dr. Wesley K. Tanaka

ABSTRACT

Conditions for separating VLDL, LDL, HDL2 and HDL3 by high-performance molecular exclusion chromatography were examined. A system consisting of a 5000PW and 2-3000SW columns was found to be capable of separating VLDL, LDL, and HDL in less than 45 minutes. Buffer flow rate and ionic strength were found to have the greatest influence on lipoprotein separation. With a buffer consisting of 0.2M Tris-acetate/NaCl (0.2M), pH 7.0 at a flow rate of 0.1 mL/min, partial separation of HDL2 and HDL3 and total separation of VLDL and LDL can be achieved. The study demonstrates the powerful separating capability of high-performance molecular exclusion chromatography in the analysis of lipoproteins.

Visualization, Velocity, and Frequency Measurements of a Two-Dimensional Jet

by

Richard S. Tankin

ABSTRACT

Laser doppler anemometry and frequency measurements along with laser sheet-lighted photographs were made on a two-dimensional jet which issues from a two-dimensional centerbody. Vortices, which are shed from the two-dimensional centerbody maintain their structural identity downstream - over the range of Reynolds numbers that were covered in this study. From some of the frequency measurements, it appears that the frequency spectrum is composed of harmonics, sums and differences (mixing) of several frequencies. No windows of chaos were observed.

PRESSURE WAVES IN FOAM AND FOAM-SAND SAMPLES

by

Joseph W. Tedesco

ABSTRACT

The understanding of material response to high amplitude, short duration, impulse loads generated in a weapons environment is an important problem in protective construction design and analysis. To model the response in the laboratory requires that the environment must reflect the type of confinement, magnitude of stress change, and the time scale of loading anticipated in the field. The Split-Hopkinson Pressure Bar (SHPB) technique can produce the required environments in the laboratory.

During the past several years researchers have deomonstrated that the SHPB technique is capable of determining the dynamic, high stress and strain rate of soil and concrete. Although the conditions of the experiment have been restrictive (e.g., conditions of uniaxial strain), this technique has significantly extended the stress and strain-rate regimes over which dynamic material properties can be investigated.

The overall objective of the study is to evaluate pressure wave attenuation in foam and foam-sand samples through an experimental program implemented on the SHPB. The results of the study indicate that both the foam and foam-sand samples are very effective in reducing the intensity of the transmitted pressure wave. Moreover, the results manifest the concept of "layered" systems as a viable alternative to conventionally hardened structures.

High Velocity Projectiles

by

Forrest D. Thomas II

ABSTRACT

Propellants WC-870, IMR-5010, H-4831, IMR-4064, IMR-4198, and 2400 were tested to 2300 grains or case failure in 30 mm aluminum, light steel, and heavy steel cases. Aluminum cases failed at 1000 grains of 2400 and 2000 grains of IMR-4064. Light steel cases failed at 1400 grains of IMR-4198, 2000 grains of IMR-5010, and 2300 grains of IMR-4064. Heavy steel cases stuck at 1900 grains of IMR-4198 and 2300 grains of IMR-4064.

Pairs of propellants - WC-870 + IMR-4064, IMR-5010 + IMR-4064, and IMR-4198 + IMR-4064 - were tested through weight ratios totaling 1800 grains, layered with the fast propellant on the bottom, the slow propellant on the bottom and with mixtures of the two. Velocities were generally faster than the slow propellant, but slower than the fast propellant. Velocities of mixtures and the fast propellant on the bottom were generally slightly faster than for the slow propellant on the bottom.

Velocities, measured 17-19 feet from the muzzle, were 6000 to 7000 fps for a number of single propellants and combinations. Maximum velocities were 7100 fps for 2300 grains of IMR-4064. The calculated muzzle velocity was 8200 fps for a 565 grain cylindrical polyethylene projectile.

THE EFFECT OF TRANSIENT SHOCK WAVES IN A MACH 3 FLOW

by

H. Doyle Thompson

ABSTRACT

The trisonic wind tunnel facilities at the U.S. Air Force Academy were used to study unsteady transients in supersonic flows. A 20 degree symmetric wedge, six inches wide, was mounted in the one foot square test section of the MACH 3 tunnel. High response pressure transducers were mounted on the upper and lower wedge surface and on the tunnel sidewall, upstream of the test section. The transient shock waves generated during tunnel start-up and shut-down, were recorded using a Schlieren optical system focussed directly on the front lens of a 16 mm high speed camera. Pressure measurements and pictures were recorded at half milisecond intervals over an eight second run time. Unsymmetrical, transient, oblique shock waves correlate with unexpected large pressure spikes. It is clear that steady flow calculations do not predict the very large, short duration forces that can arise in transient supersonic flows.

A COMPUTATIONAL MODEL OF RESOURCE ALLOCATION IN EXPERTS AND NOVICES

by

David J. Townsend

ABSTRACT

Many real-world tasks require decisions about how to allocate available resources to accomplish various goals. Devising training programs to make these decisions requires an understanding of how experts and novices differ in the decision making task. Research in artificial intelligence and cognitive psychology has provided a general basis for this understanding. The purposes of this study are to develop a model of the resource allocation process, to identify the stages in the process in which there might be differences between experts and novices, and to determine how those differences could be represented in a formal model. Future research should focus on building detailed models of expertise in problem solving, particularly on how experts organize knowledge about their domain of expertise, and on how they use their prior knowledge to form a representation of problem information.

DEVELOPMENT OF AN ANIMAL MODEL FOR G-INDUCED LOSS OF CONSCIOUSNESS

by

Michele L. Trankina

ABSTRACT

Rats were subjected to both rapid and gradual onset of high G-forces using the USAFSAM centrifuge. Amplitude decreases in EEG and ECG recordings obtained during centrifuge runs indicated that, at least in some cases, G-induced loss of consciousness could be simulated using an animal model. Adaptation of the brain-blower device to the centrifuge for sampling of brain tissue during high G exposure also was achieved. Development of additional models of cerebral ischemia, apart from the centrifuge, also was initiated. A novel means of recording EEG signals from rat skulls was designed and implemented.

<u>An Advanced Vision System Testbed</u>

by

Robert G. Trenary
Louis Tamburino
William VanValkenburgh

ABSTRACT

The design for a system which automatically extracts meaningful features from a set of images is described. The features are used as the basis for a classifier . The adaptation of the system is based on an evolutionary algorithm enlightened by learning strategies which use knowledge gathered about the problem domain during the training process. The experiments are implemented using an image processor which provides parallel operations in a novel and efficient manner.

OZONATION OF FIREFIGHTER TRAINING FACILITY WASTEWATER AND ITS EFFECT ON BIODEGRADATION

by

Dennis D. Truax, Ph.D., P.E.
Ethan S. Merrill

ABSTRACT

Firefighter training at airports and airbases is a necessary activity generating wastewaters containing a combination of fuel, surfactant based firefighting agents, and particulates. The Air Force is engaged in an effort to develop a treatment scheme for these waste flows. At present, the biodegradability of the waste contained in these discharges is of some concern. This research briefly examined the impact of preozonation on microbial conversion of contaminates remaining in these wastewaters after gravimetric oil and particulate removal.

Based on the results of this project, it appears that adding ozone to waters containing jet fuel and/or surfactants will enhance biodegradation of the substituent organics. For waters containing only fuel, it seems that organics are converted to a more biodegradable form with the degree of degradability increasing with ozone addition. The surfactant studies, and to some extent the wastewater studies, indicate a threshold and an optimum ozone dose exist. The threshold occurs when the surfactants' bioinhibitory nature is destroyed and the microbial utilization of organics resulting from waste oxidation can proceed. However, once the optimum is reached, ozone-based oxidation destroys these organics at a rate equal to or greater than their production.

EFFECTS OF ADAPTATION TO FOURIER DESCRIPTOR STIMULI ON DISCRIMINATION THRESHOLDS FOR VISUAL FORM

by

John Uhlarik

ABSTRACT

Visual discrimination thresholds were obtained for Fourier descriptor (FD) stimuli for shape in the manner similar to contrast sensitivity functions (CSFs) that have been obtained for grating stimuli. Adaptation to a specific FD harmonic frequency produced a selective elevation of threshold (i.e., decreased sensitivity) for the adapting frequency and closely related even harmonic frequencies. These findings suggest that FDs have the potential to provide a metric for visual form and could provide a new model of human form perception.

PREDICTION OF STRUCTURAL RESPONSE TO SONIC BOOMS:

AN ASSESSMENT OF TECHNOLOGICAL GAPS

By

P. G. Vaidya

Abstract

A critical study of the relevant Sonic Boom literature and a few preliminary research projects were carried out. The aim was to assess the technology to predict the structural response to sonic booms, generated by the U. S. Air Force operations. The specific goal was to identify technology gaps, which might exist in being able to carry out a technologically sound prediction.

It turned out that there were indeed many technological gaps. Major gaps have been found in terms of inadequate accounting of the effect of the "Metastructure" and in the width and depth of data. These gaps have been ennumerated and recommendations for future work made.

Model-free Statistical Analyses of Contaminated Ground Water

by

Joseph S. Verducci

and

Steven J. Naber

ABSTRACT

A detailed statistical analysis of two plumes of contaminated ground water at Wurtsmith Air Force Base in Michigan serves as a prototype for analyses that may be conducted at other sites. The statistical techniques include graphical methods based on spline smoothing, regression methods for quantifying bias, and nonparametric methods for assessing trends. Because the results of these analyses depend only minimally on assumptions about solute transport, they can be used either as prima facie evidence or to provide a check on the applicability of various plausible solute transport models.

Given the short length of time series available at most sites where ground water is monitored, there are currently few alternatives to solute transport models for assessing time trends. New research on probability distributions of ranked data offers hope for combining information from various wells in a region in order to assess regional trends and patterns for short time series.

MICROSTRUCTURE AND MECHANICAL PROPERTIES OF TITANIUM ALUMINIDES

by

Robert C. Voigt

ABSTRACT

Microstructural characterization of both rapid solidification processed (RSP) and ingot melted (IM) titanium aluminides is reported. Work is in progress to characterize and test 26 RSP ternary titanium aluminide alloys with additions of Nb and Sn, Hf, Zr, C, Si, B, or Er_2O_3 at various levels. Alloys in ribbon form and after extrusion at 1950°F (1070°C) have been evaluated. The microstructure of an IM alloy (Ti-Al-Nb-Mo-V) has also been characterized after various forging and heat treatment conditions. Variations in forging temperature, solutionizing temperature and aging temperature was shown to control the amount, morphology, and distribution of the primary α_2 phase, as well as the fineness of the secondary $\alpha_2 + \beta$ structure that forms upon aging. A detailed mechanical testing program for this alloy is currently underway.

EXCITATION CROSS SECTIONS OF ATOMIC OXYGEN by ELECTRON-IMPACT DISSOCIATIVE EXCITATION OF O_2

by

Keith G. Walker

ABSTRACT

Molecular oxygen was subjected to a 4.0 keV electron beam operating in a beam plasma discharge mode. The resultant emission spectra were analysed from 400 nm to 882 nm. From these spectra the relative intensities of atomic oxygen lines were determined. Good agreement was obtained when compared with published cross section measurements taken at much lower electron collision energies and under more controlled conditions. The mechanism which makes this possible is discussed and a theoretical model is suggested. The results of these measurements find importance in the analysis of atmospheric phenomena induced by electron disturbances.

FIFTH FORCE STUDIES FOR A LAYERED EARTH

by

Richard C. Walker

ABSTRACT

Yukawa and Newtonian components of gravity over a spherically symmetric layered medium are calculated as superpositions of respective components for uniform spheres of appropriate radii and densities. Outside the surface both components exhibit attenuation-with-distance characteristics completely describable in terms of relative Yukawa amplitude (α) and the ratio of surface radius to Yukawa "wave-length" (R/δ). Introduction of a parameter Ψ, sensitive to existence of the Yukawa component and calculable from the total field, enables study of layering effects and determination of required measurement precision. Introduction of lateral inhomogeneities exposes limitations of the Ψ-parameter, layered-sphere approach and suggests alternate possibilities.

MAGNETOSTATIC WAVE STUDIES

by

I. Jacob Weinberg

ABSTRACT

A combined two terminal (TT) and transmission line (TL) model for magnetostatic surface wave insertion loss was developed and implemented on the Hanscom AFB Cyber computer. Results compared favorably with experiment when compared with the individual TT and TL models.

Width mode effects were implemented in the magnetostatic surface wave dispersion relation program and the wider frequency bandwidth of wave excitation that was now obtained conformed favorably with experiment. The analysis for width mode effects for the dispersion relation for magnetostatic surface waves and magnetostatic forward volume waves are herein presented.

All computer programs are now implemented in interactive mode on the Hanscom AFB Cyber computer to provide much faster printed and graphical results.

Lateral Resupply of Spare Parts

by

Howard J. Weiss

ABSTRACT

The issue of lateral resupply of spare parts in a multi-echelon inventory system was investigated. Two major questions must be answered. What is the effect of any resupply policy on backorders at the bases? What is the optimal lateral resupply policy? Emphasis was placed on the latter question. Unfortunately, the problem size is too large to use dynamic programming to find the optimal policy. Therefore, a simulation must be used to help to do this. A prototype simulation was written to answer some basic simulation design [illegible] are discussed in this report.

DESIGN OPTIMIZATION OF COMPLEX SYSTEMS BY GOAL DECOMPOSITION

by

Charles E. Wells

ABSTRACT

A new architecture of a decision support system for engineering design using decomposition was examined and analyzed. Three different types of optimization problems were identified in the design hierarchy. A goal decomposition method was developed for mid-level design problems which included an algorithm that caused optimization at a lower level in the design decomposition hierarchy to seek solutions that were consistent with higher level goals. At the lowest level of the design hierarchy, a model was investigated for the case that designs already existed and were "frozen." A model was devised that achieved a global optimal solution but avoided having to include all possible frozen subcomponent designs in the model. The managerial implications of employing decision support in the design process was studied.

Thermal Physiology:

Selected Field Study Problems and Methodology

by

Ward Tom Wells

Various methods of collection of physiology field study data and administration of thermal physiolgy studies were participated in during the summer research period. An acclimatization field study using miniature physiological recording instruments was developed and completed during the summer. The results were similar to that found in the classic heat literature. The investigator also participated in data collection in ongoing studies of firefighter fitness, of the energy costs of EOD personnel functions, and of cooling systems for use with chemical defense ensembles. Using the resources of USAF SAM/VNC (principal investigators, laboratories, library), program objectives of increasing my knowledge of thermal physiolgy, in general, and the the research questions specific to the needs of the AFOSR were met.

ADAPTIVE FILTERING OF EVOKED BRAIN POTENTIALS

by

John J. Westerkamp

ABSTRACT

Multichannel adaptive signal enhancers for estimating human evoked brain potentials (EPs) were investigated. The standard transversal filter least-mean-squares (LMS) algorithm was examined first and found to converge too slowly. Efforts were then directed toward preprocessors which enabled the LMS algorithm to converge more rapidly by orthogonalizing the input data. Gradient adaptive lattice and fast Fourier transform (FFT) preprocessing were considered. Simulation tests with random data demonstrated the improved convergence. All tests with human EP data showed that adaptive filters could provide single response estimates of the EP, but the slow convergence of the algorithms resulted in large biases in the early components of the EP. These results led to questions concerning the learning and extinguishing behavior of the LMS algorithm, which will be addressed in a follow-up study.

Thermal Fatigue of Ceramic Matrix Composite (CMC) Materials

by

Robert C. Wetherhold

ABSTRACT

In order to meet the design requirements for high efficiency heat engines and hypersonic airframes, new high temperature materials such as ceramic matrix composites (CMC) must be developed. Since these materials will be subjected to large thermal excursion under operating conditions, the problems of thermal fatigue (TF) and thermomechanical fatigue (TMF) must be addressed. A model system of Nicalon SiC fibers in a Corning 1723 aluminosilicate glass which is currently available should show the characteristic CMC behavior. However, at this point, the critical variables which influence damage are not known. Screening tests have therefore been devised to assess the damaging effects of: (1) average matrix stress on a composite with a given cyclic stress amplitude produced by TF, and (2) the effect of cyclic inelastic creep strain. These tests are described in sufficient detail to allow testing to begin, but require additional work to obtain quantitative predictions. In addition, the available experimental techniques which have been employed this summer are reviewed, and some recommendations for improvement are given.

Mode Extraction from an Electromagnetic Slow Wave System

by

W. Perry Wheless, Jr.

ABSTRACT

In a class of high power, high frequency electromagnetic sources based on magnetically insulated transmission line (MITL) principles, predominantly TM_{01} field energy is generated in a coaxial oscillator structure. To transfer energy into the electromagnetic field, it is required that the oscillator region be a slow wave structure, which is accomplished by appropriately corrugating the coax outer conductor. On the other hand, transmission and radiation structures are generally fast wave devices. Consequently, it becomes necessary to transition from a slow wave to fast wave condition.

The primary objective of this study was the development of a methodology for extracting the slow wave TM_{01} field into a corresponding fast wave mode. Phase velocity and wave impedance properties of corrugated slow wave coax structures were investigated to determine the effects of variable slot and tooth width, as well as slot depth. Wave impedance matching and transformation techniques were surveyed, and Chebyshev transformer sections were selected as appropriate to a prototype transition structure design. A basic lumped element equivalent circuit model for the TM_{01} mode was developed, which is conducive to the Chebyshev transformer design procedure. Computer simulation runs have indicated that the model is incomplete, and will require enhancement. The circuit model resulting from this study, nonetheless, provides a good basis for subsequent analyses and developments.

HYPERBARIC (3ATA) OXYGEN 100% THERAPY AS AN ADJUVANT IN THE TREATMENT OF RESUSCITATED (LACTATED RINGER'S & DEXTROSE 5%) GUINEA PIG BURN (3^{O}, 50 BSA) SHOCK.

by

Stanley J. Whidden, M.D., Ph.D.

ABSTRACT

Fourteen (14) male guinea pigs (400± 35 kg) with indewelling arterial and venous catheters and indwelling thermistors were temporarily anesthetized with Metofane and scalded through a template in 100°C water to produce a full skin thickness burn over 40% of the BSA. These animals were treated with the resuscitation fluid formula isobaricly or hyperbaricly O_2 (100% 6 ATA). All animals showed a post burn (PB) decrease 2°C±.3 in body temperature and 50% drop in cardiac output. The burn produced a hemoconcentration at 1/2 hour PB which returned to preburn by 6 hours in both groups. Plasma lactate levels rose PB in all samples but were higher in the isobaric group. Heart rate and blood pressure both dropped PB at 1 hour but recovered by 6 hours in both groups. Dermal histochemistry samples are still being studies and as of this time there are no conclusive observations. These data trend to indicate that there was some improve-ment on the hemodynamic and metabolic changes during burn shock in the guinea pigs treated with hyperbaric O_2 (3 ATA 100%) and Formula as compared to isobaric (1 ATA 100%) and Formula. More work needs to be done to delineate these observations by the addition of more central control groups.

Perfluorodecanoic Acid Interactions with Mouse Lymphoma Cells and Primary Rat Hepatocytes

by

Andrew P. Whipple

ABSTRACT

Mouse lymphoma cells take up only a few percent of the perfluorodecanoic acid (PFDA) presented to them and this uptake is blocked by bovine serum albumen in the medium which rapidly binds 99% of the available PFDA. The uptake of PFDA by the lymphoma cells is complete by 20 - 60 minutes. The maximal amount taken up per cell is a constant percentage of that presented over a wide range of concentrations up to lytic doses and shows no evidence of saturation but rather appears to be in an equilibrium with the free PFDA. Primary rat hepatocytes in suspension culture take up 90% of the applied PFDA within 20 - 60 minutes but only 1 - 10% when in monolayer culture. This uptake is also blocked by bovine serum albumen. In suspension the uptake is maximal by 20 - 60 minutes with most of the uptake complete in 5 minutes, while in monolayer culture the uptake appears to be linear over the first 20 minutes.

Sharon T. Williams

ABSTRACT

A gas-chromatographic procedure was developed for the analysis of omega-3 and other polyunsaturated fatty acids in serum lipid fractions of patients with and without coronary artery disease (CAD). The analytical procedure involved extracting the lipids from serum, separation of the individual lipid classes by thin-layer chromatography, hydrolysis of the individual lipid classes, and derivatization and gas-chromatographic analysis of the individual fatty acids in each of the lipid classes (phospholipid, cholesterol ester, and triglyceride). Five fatty acids were evaluated as candidate internal standards and methyl lignocerate was selected for use in this procedure. The fatty acid compositions of the phospholipid and cholesterol ester fractions were determined in serum from 18 patients with CAD and in 12 patients without CAD. The mean and standard deviations of the fatty acids compositions are given on both a quantitative and weight percentage basis. The results indicate that the omega-3 fatty acids of the cholesterol esters differ from those of the phospholipids. In addition, the omega-3 fatty acid compositions of patients with CAD differ from those without CAD. We conclude that the omega-3 fatty acid concentrations in serum may represent a new independent risk factor for predicting early coronary artery disease in the relatively young flight-crew members.

IN VITRO CYTOTOXICITY ASSESSMENT VIA TWO-DIMENSIONAL POLYACRYLAMIDE GEL ELECTROPHORESIS

by

Frank A. Witzmann, Ph.D.

ABSTRACT

The cytotoxic effect of perfluoro-n-decanoic acid (PFDA) on L5178Y mouse lymphoma cells was studied in terms of PFDA's influence on cellular protein expression and secretion *in vitro*. Intracellular proteins and proteins of cellular origin that appeared in the culture medium were analyzed by high-resolution two-dimensional polyacrylamide gel electrophoresis. The development of this technique made it possible to generate polychromatic protein patterns of cell lysate and spent medium samples from normal and variably intoxicated cell cultures for visual comparison. Various cellular proteins were altered as a result of PFDA exposure such that in some cases the expression of specific proteins was diminished while in others it was abolished entirely. Furthermore, dose and duration specific effects on protein expression were noted. Cellular proteins appearing in the culture medium were also altered with PFDA intoxication. Identification of the effected proteins and elaboration of the mechanism awaits further study. These results lend support to the notion that *in vitro* toxicity testing methods may serve as an adjunct to traditional test systems when the two-dimensional electrophoretic technique is included.

LOW VELOCITY IMPACT OF GRAPHITE/EPOXY PLATES

by

William E. Wolfe
Gregory A. Schoeppner

ABSTRACT

Instrumented drop weight impact tests were conducted on laminated graphite/epoxy panels. Impact velocity as well as the load time history were recorded for each specimen tested. The impactor was a hardened steel hemispherical tup to which a variety of weights could be attached. Impactor weights used in this study ranged from 9.5 pounds to 103.5 pounds. The graphite epoxy panels tested were either 0/90 or $\pm$ 45 degree layups made in thicknesses of 16 and 32 plies. Correlations were made between the amount of damage expressed as damage area and the impact energy. The amount of damage was found to be dependent upon the energy at impact and to a somewhat lesser degree on the velocity of the impactor.

THE ACTIVE CONTROL OF ALTITUDE OVER DIFFERING TEXTURE

by

Lawrence Wolpert, Ph.D.

ABSTRACT

The two objectives of this contract included a review of the *field-of-view* and retinal field literature, and the design and execution of a study to examine the perception and control of altitude over different types of ground texture. Since data collection has been delayed, this report only contains a detailed proposal of the study. The literature review will appear in a book chapter edited by Warren and Wertheim.

The Interface Contribution to GaAs/Ge Heterojunction Solar Cell Efficiency

by

Cheng-Hsiao Wu

and

John Bullock

ABSTRACT

A solar cell formed by growing a p on n AlGaAs/GaAs heteroface homojunction on a thin Ge substrate is studied by investigating the contribution of the GaAs/Ge heterostructure to the solar cell efficiency. The existence of interface states is required in order to produce the photovoltaic effect with an open-circuit voltage of about 0.1 volt as experimentally observed. Dark current-voltage characteristics of the GaAs/Ge heterojunction are calculated when the carrier transport is by thermionic emission and tunneling mechanisms. Our evaluations correctly explain the decrease of efficiency and fill factor, the increase of open-circuit voltage and the insignificant change of short-circuit current as compared to GaAs/GaAs solar cell. If the short-circuit current from the heterojunction is of the order of 100mA or less, the reduction of the solar cell efficiency is about 0.5% to 1.5% over a wide range of GaAs/Ge doping concentrations. A low interface-state condition will degrade the fill factor while soft-breakdown in the reverse-biased region will increase the fill factor. The efficiency is controlled by the forward-biased part of the dark I-V curve. Increase of total efficiency is possible if only a small amount of interface states is generated.

PARALLEL PROCESSING AND NUMERICAL LINEAR ALGEBRA

by

Joan Wyzkoski

ABSTRACT

Parallel or multi-processing can be defined as the simultaneous use of several computer processors to solve a problem. Most computers have only one processor. Within the past three to four years, computers equipped with 2 to over 65,000 processors have become commercially available. Algorithms that perform efficiently on a single processor system do not always experience a decrease in runtime when they are implemented on a multiprocessor machine.

The goal of this project was two-fold. The first was to become familiar with the current research being conducted in parallel processing. To explore the restructuring of numerical linear algebra algorithms to take advantage of a particular parallel architecture, the hypercube, was the second objective. The specific algorithms were the product of a matrix times a vector and the product of two matrices. The results of these investigations are outlined.

Semi-Empirical Molecular Orbital (MOPAC) Studies of Energetic Materials: Nitrogen Heterocyclics and Nitroenamine

by

Melvin E. Zandler

ABSTRACT

Semi-empirical molecular orbital calculations on various compounds were performed with AM1 and MNDO using the MOPAC program running under UNIX on a PC equipped with an AEON 32-bit accelerator board. The enthalpy change for intermolecular hydrogen transfer from the amine group of one molecule to the nitro group of the second molecule was computed with the AM1 model using UHF for nitroenamine (27.34 kcal/mol), 5-nitro-2H-tetrazole (26.47 kcal/mol) and 3-nitro-1,2,4-triazolin-5-one (NTO) (22.47 kcal/mol). Although considerable effort was expended, the search for a transition state for each of these processes was unsuccessful. The barrier for intramolecular hydrogen transfer in NTO was 62.78 kcal/mol. A large systematic difference between AM1 and MNDO heats of formation was observed for nitrogen heterocyclic compounds. The difference depends greatly on the number of nitrogens in the ring and little on the detailed bonding pattern suggesting that a new parameterization for nitrogen is needed. Preliminary studies of energy partitioning and transfer among vibrational modes may lead to methods of estimation of detonation sensitivity.

Specification of a Computer Aided Design System

by

George W. Zobrist

ABSTRACT

This study has as an objective the investigation of the characteristics and various philosophies of computer aided engineering, computer aided design/drafting, and computer aided manufacturing (CAE/CAD/CAM) systems and the associated networking environment. The objective is to meet an increase in the productivity of the engineering/design/drafting/assembly operation to reduce future/current operating costs through the utilization of a design automation environment.

Additional objectives of the research effort are to survey the needs of the ESMC design effort as they exist today and the projected usage. This involved discussions with engineers, designers, drafters, and managers with ESMC and the various contractors. The milestones will be the capture of data to develop hardware/software requirements and hence a preliminary computer aided design philosophy. Part of the effort was also to obtain information on computer aided design tools that are available and their applicability to the ESMC automated design effort and to visit various USAF installations which have existing computer aided design efforts.

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